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THESIS

**PATTERNS OF MARINE CORPS RESERVE
CONTINUATION BEHAVIOR:
PRE- AND POST-9/11**

by

Joseph M. Lizarraga

March 2011

Thesis Co-Advisors:

Stephen Mehay
Jonathan Price

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**PATTERNS OF MARINE CORPS RESERVE CONTINUATION BEHAVIOR:
PRE- AND POST-9/11**

Joseph M. Lizarraga
Major, United States Marine Corps
B.A., Arizona State University, 1996

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requirements for the degree of

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March 2011**

Author: Joseph M. Lizarraga

Approved by: Stephen L. Mehay
Thesis Co-Advisor

Jonathan D. Price
Thesis Co-Advisor

William R. Gates
Dean, Graduate School of Business and Public Policy

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ABSTRACT

This thesis identifies the effects of mobilization on Marine Corps Reserve non-prior service (NPS) personnel continuation rates. The research evaluates the retention effects of reservists' expectations about mobilization by analyzing retention data from three separate time periods—Pre-9/11, Overlap-9/11, and Post-9/11.

The analysis used monthly observations for NPS reserve enlisted personnel who have completed their initial 6-year obligated drilling contracts. This research analyzed the end of contract “waterfall” period, which describes the drastic drop in reserve continuation that takes place upon the completion of NPS reservists drilling obligation. Analysis was performed using multivariate models for each time period, which consider the effects of mobilization, as well as other explanatory variables for demographics, military performance, education benefits, unit type, geographic region, and unemployment rate.

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LIST OF ACRONYMS AND ABBREVIATIONS

ADOS	Active Duty Operational Support
AC	Active Component
AR	Active Reserve
ASL	Active Status List
ACOL	Annualized Cost of Leaving
AFQT	Armed Forces Qualification Test
CNA	Center for Naval Analysis
CONUS	Continental United States
DMDC	Defense Manpower Data Center
DOD	Department of Defense
FY	Fiscal Year
FMCR	Fleet Marine Corps Reserve
IDT	Inactive Duty Training
ISL	Inactive Status List
IMA	Individual Mobilization Augmentee
IRR	Individual Ready Reserve
IADT	Initial Active Duty for Training
M&RA	Manpower and Reserve Affairs
MCRC	Marine Corps Recruiting Command
MCTFS	Marine Corps Total Force System
MARFORRES	Marine Forces Reserve
MOS	Military Occupational Specialty

MSO	Military Service Obligation
NCO	Noncommissioned Officer
NPS	Non-prior Service
OCONUS	Outside the Continental United States
PMOS	Primary Military Occupational Specialty
RA	Reserve Affairs
RAP	Reserve Affairs Personnel Plans, Policy, and Programming
RC	Reserve Component
RCCPDS	Reserve Component Common Personnel Data System
SMCR	Selected Marine Corps Reserve (Units)
SELRES	Selected Reserve
SNCO	Staff Noncommissioned Officer
TFDW	Total Force Data Warehouse
TCPG	Training Category Pay Group
USERRA	Uniformed Services Employment and Reemployment Rights Act

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I. INTRODUCTION

A. PURPOSE

This thesis investigates the probability of Marine Corps reservists continuing service in the Selected Marine Corps Reserve (SMCR) drilling units an additional year after completing their initial contractual obligation of 6 years. Unlike prior attrition studies, this thesis does not intend to investigate early attrition that occurs during an individual's 72-month contract, but rather focuses on the decision point at which a reservist has satisfactorily completed the initial obligated service. These individuals are not contractually bound to continue drilling and may leave the SMCR drilling units at any time. The population of interest will be non-prior service (NPS)¹ reserve enlisted personnel. More specifically, those NPS enlisted personnel will be examined who have served on their initial contract of obligated service where they are required to drill with reserve units for 6 years, and then serve in the Ready Reserve² for 2 years. These contracts are commonly referred to as 6x2 Contracts, and although there are other term contracts associated with NPS personnel, the 6x2 Contract is the most prevalent, encompassing roughly 98% of the total SMCR NPS population (MCO 100R.1K, 2009, March).

The primary goal of this thesis will be to identify the effects of mobilization³ and its influence on Marine Corps Reserve NPS personnel continuation rates. As numerous previous reserve studies indicate, Post-9/11 mobilizations have placed an increased

¹ Non-prior Service (NPS) personnel are contracted to serve in the Ready Reserve for an initial 8 years of Military Service Obligation (MSO). Simply put, they are those reservists who have never before served in the military. There are four different types of contracts, which all total to an 8-year obligation. The majority of these NPS accessions serve under 6x2 contracts, as explained above.

² Ready Reserve obligation refers to the period of time in which Marines still have time remaining on their total MSO but are not required to participate in monthly drills, except to muster no more than once a year. This period provides for a pool of pre-trained manpower which can be mobilized during national emergency or war.

³ Mobilization refers to the activation of a reservist for the purpose of directly supporting a military contingency operation. In the case of NPS reservists, an SMCR unit is mobilized to support the operation and therefore most mobilizations which are involuntary in nature include NPS personnel.

burden on our reserve forces. Understanding how this increased burden has affected reservists may provide helpful insight for Marine manpower planners to consider when shaping the future reserve force. Additionally, important attention should be focused on whether reservists' expectations toward mobilization have been affected in such a way that they are closely correlated with continuation rates during different time periods, Pre-9/11 and Post-9/11.

Mobilization effects will be tested by using multivariate analysis to isolate the effects of individual categorical variables on the likelihood of continuing service 1 year beyond their completed obligation. Independent variables such as demographics, military performance, education benefits, unit type, geographic location, and unemployment rates will be utilized.

B. BENEFITS OF THE STUDY

There are currently no previous studies specifically examining Reserve NPS continuation rates within the Marine Corps. The results of this study will be beneficial to manpower planners in several ways. First, the training costs from losing too many reservists due to attrition and retention is of vital interest, especially given the climate of fiscal austerity amidst unprecedented congressional budget deficits. During Fiscal Year 2010, the Marine Corps spent \$123 million in reserve training. This exceeded their initial annual appropriation for reserve training by 28%. Much of this elevated training cost is traceable to high attrition and loss rates within the reserve force. Therefore, determining the issues surrounding continuation behavior of NPS personnel is a high priority for manpower planners. Second, this study will help assist in the development of future SMCR end strength models, by identifying predictors and estimating their effects on the probability of continuation. Third, the data will help manpower planners in developing more accurate reserve recruiting goals and accessions in order to assist in the development of the Marine Corps first ever "Reserve Continuation Mission" for Fiscal Year 2012. Lastly, by examining the various models presented within this thesis, manpower planners can utilize pertinent continuation probabilities that occur during specific time periods of intense utilization, such as during operations in Iraq and

Afghanistan, as well as the probabilities of continuing service during more moderate or minimal utilization periods, such as periods prior to September 11, 2001. These findings hope to ultimately provide an enhanced understanding of reserve continuation rate behavior. Enough specificity will be given to assist in developing future incentive and other reserve policies aimed at minimizing future unnecessary reserve losses and excessive training costs while continuing to utilize the Marine Corps Reserve as an operational force for the foreseeable future.

C. BACKGROUND

1. Increased Utilization of the Marine Corps Reserves

During the last 20 years, the increased utilization of the Reserves in support of both military contingency operations and humanitarian assistance has marked the conclusion to the longstanding previous “strategic posture” of the Reserves. In particular, since September 11, 2001, to current day operations, the Reserves share an increased portion of the nation’s operational strain sustained by both the Iraq and Afghanistan conflicts.

Specific to the Marine Corps Reserve, deployments spiked for the SMCR in the post-9/11 era and reached a peak just after the commencement of Operation Iraqi Freedom (OIF) in April of 2003. Figure 1 depicts the Marine Corps Selected Reserve (SelRes) activation⁴ patterns from September 2001 to September 2009. These figures represent total numbers of SelRes personnel who were serving on active duty in support of a contingency operation at any given time during these periods.

⁴ Activation refers to the period of time when the reservist’s part-time reserve status transitions to active duty for a specified period of time. Activations can either be involuntarily or voluntary. The preponderance of activations usually arises from involuntary unit activations in support of various combat operations or humanitarian related operations. The term mobilization is often used synonymously with activation, but in technical terms is limited to involuntary activation.

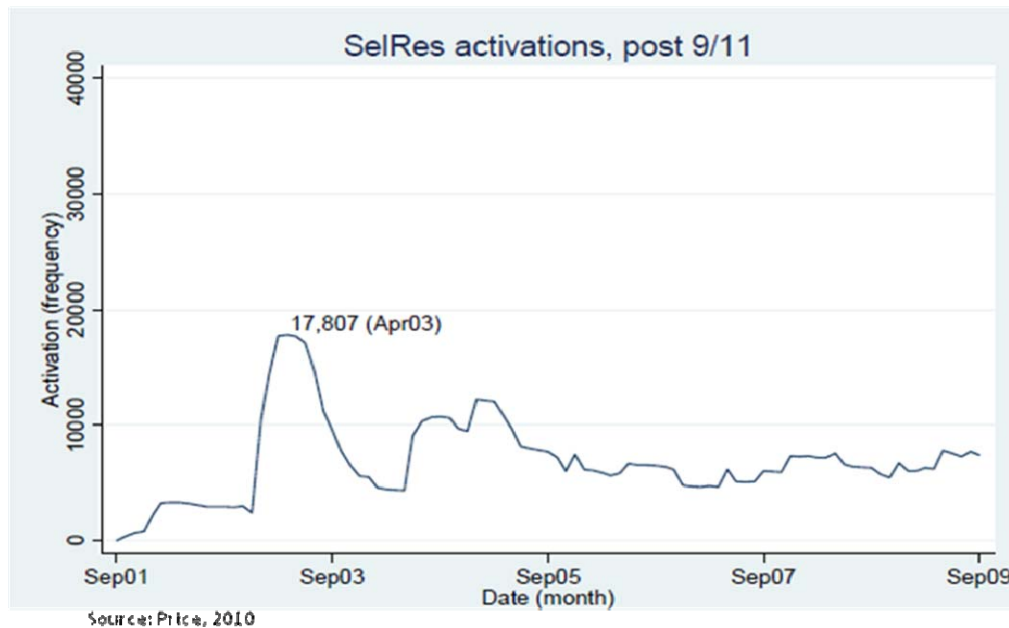


Figure 1. Post-9/11 Frequency of SelRes Activations

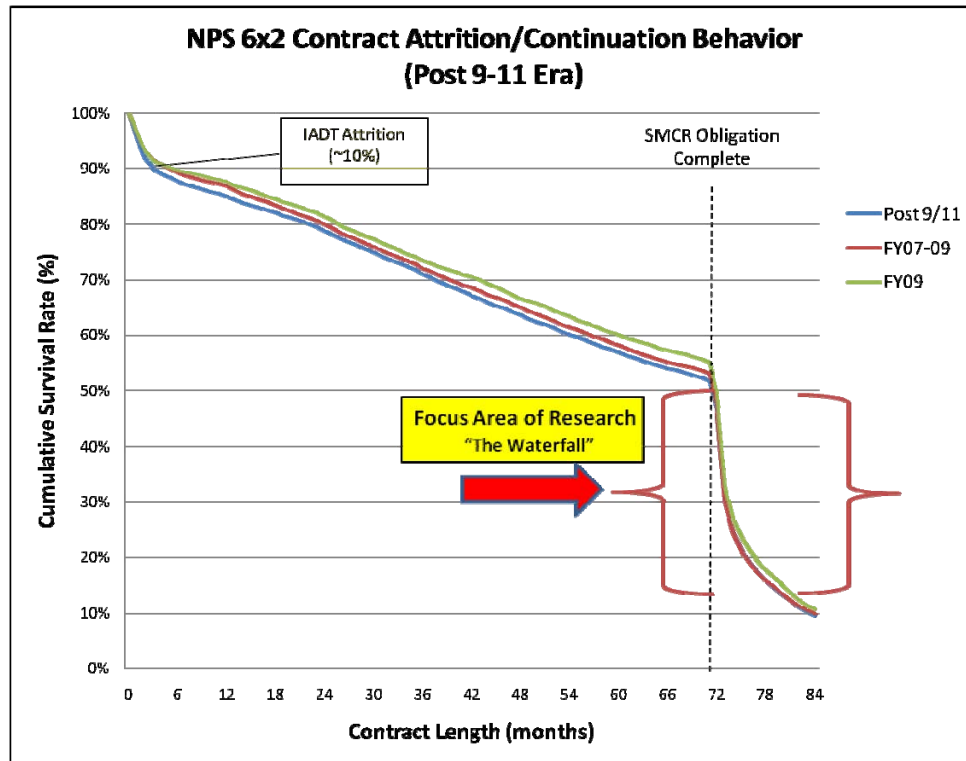
On average, there were 6,927 SelRes Marines per month serving on activation orders from September 2001 to September 2009, with this number peaking at 17,807 in April of 2003 just after OIF. The operational contributions made by Marine Corps reservists have been essential to maintaining the intense operational demand required to sustain two major conflicts simultaneously. Their role has proven to be so valuable that the Secretary of Defense called for the reserve components of each of the services to be managed as “operational forces” and integrated into each service’s operational planning.⁵ Only time will tell how these increased demands and this new operational posture will affect reserve retention and attrition behavior (DoD Directive 1200.17, 2008, October).

⁵ Department of Defense Directive 1200.17 is a new initiative prompted to ensure reserve forces are to provide both operational capabilities and strategic depth in order to meet U.S. defense requirements across the full spectrum of conflict. It is aimed to synergize efforts from a more “total force perspective” and utilize reserve forces in a manner which increases the overall effectiveness of force planning and execution.

2. Current Trends in NPS Continuation Rates

The largest segment of the Marine Corps Reserve likely to be affected by this increased utilization is the NPS population. Since virtually all NPS reservists drill with SMCR units, they are the most susceptible to involuntary activation and mobilization. Current data indicates that NPS reservists average less than 50% attrition over the life of their 6-year drilling obligated contract. Of those who complete their 72-month contracts, 81% do not continue service for an additional period of at least 12 months beyond their completed Mandatory Drill Participation Stop Date (MDPSD).⁶ The scope of this thesis will not cover the former attrition problem, but rather will focus attention toward the latter continuation problem associated with those who choose not to serve beyond their initial obligations. This problem is depicted in Figure 2. Notice the drastic decline in the cumulative continuation survival rate at the 72-month mark and beyond. This area will be commonly referred to as the “Waterfall” throughout this thesis (see Methodology, Chapter V). This period warrants further investigation to determine the various factors associated with this decline.

⁶ Mandatory Drill Participation Stop Date (MDPSD) refers to the period of time that the service member has met their mandatory drilling obligation with an SMCR unit. This period falls within their total Military Service Obligation (MSO) which encompasses the service member’s required drilling obligation, as well as, their total required Ready Reserve time. For example, in the case of a NPS reservist serving on a 6x2 contract, the 6 years represent the mandatory drill participation time while the 2 years are encompassed within their total MSO.



Source: Marine Corps Reserve Retention Brief presented in New Orleans, LA on July, 21, 2010 Author: M&RA, Quantico, VA.

Figure 2. NPS Continuation Behavior Graph

In prior research on active duty and reserve attrition and retention studies, the focus has been primarily on whether the service members remain until the end of their obligated contract or if they choose to be retained past their initial contract. This approach, however, does not take into consideration the unrestrictive nature of reserve contracts.

Reservists' movement in and out of drilling service once they complete their initial obligation is much less restrictive than the active component and can often be intermittent during the months following their completed SelRes obligation when they are technically no longer required to report to drill duty. Even if they formally reenlist, there is nothing binding them to continue to serve. Furthermore, if they have received a reenlistment bonus to continue service and chose not to continue, all that is required from them is to pay back their reenlistment bonus to the government. Beginning in Fiscal Year 2011, individuals accepting reenlistment bonuses will be subject to administrative

separation from the Marine Corps; however this policy change will apply to less than 3% of the population due to the limited nature of reenlistment bonuses in the Marine Corps Reserve. Consequently, given this unique dynamic, standard retention studies do not ultimately capture a person's probability of continuing service beyond his/her initial drilling obligated period of service.

3. Importance of Retaining NPS Reservists

As previously mentioned in the benefits of this study, Marine Corps Reserve training costs currently exceed the annual allocated budget. Much of this problem may be attributed to an excessive number of NPS reservists who do not continue serving beyond their Military Service Obligations (MSO)⁷ and leave more senior leadership positions vacant. The problem is two-fold: not only are those positions required to be filled via new accessions, but also those vacancies leave units with those of lower rank and experience to fill critical leadership positions. This potentially could have spillover effects in terms of unit cohesion, readiness, and morale, which adds more complexity to the current retention issues.

Fundamentally, this non-continuation rate phenomenon could potentially jeopardize the overall long-term size and health of the senior leadership population. For example, many Marines who choose not to continue drilling potentially represent a large portion of the high quality Marines that would be beneficial for the Marine Corps to retain. This would directly impact the Marine Corps' ability to grow its senior leadership in the ranks of Staff Sergeants, Gunnery Sergeants, First Sergeants and Master Sergeants.

4. USMC Design Paradigm

Historically, the Marine Corps is a fighting force that has concentrated its manpower in the junior enlisted and officer grades resulting in a vibrant 'young warrior'

⁷ Military Service Obligation (MSO) refers to the mandatory obligated service period required for each service member. All service members who are inducted into the Armed Forces after June 1, 1984, incur an 8-year total obligation period. Not to be confused with the Mandatory Drill Participation Stop Date (MDPSD), this only refers to the period of time in which the service member is required to drill with their unit.

mentality. Manpower planning, by design, accounts for a preponderance of first term enlistees leaving service after completing an initial enlistment contract, and provides for a high ratio of junior subordinate Marines to senior leaders. By doing this, it helps maintain correct grade distributions throughout the Marine Corps. In addition, Title 10 of the United States Code provides legislative limitations on grade strengths and imposes years of service limitations by rank for the active and reserve components, establishing the up-or-out system (Title 10, *U.S.C.*, §413). For these reasons, this manpower structure is not designed to retain the majority of Marines. Thus, the force structure only provides boat spaces for approximately 25% of the population of those highly qualified individuals to be reenlisted and promoted. The same considerations apply to the reserve model. One control measure that currently exists within the Marine Corps is called the Enlisted Career Force Control (ECFC) Program. According to the Marine Corps administrative message titled, “MARADMIN 505/10” (2009), in order to assist in the effective shaping of the force by grade and MOS, the Marine Corps has set the following Time in Service (TIS)⁸ promotion targets:

Sergeant (Sgt)	4 Years
Staff Sergeant (SSgt)	8.5 Years
Gunnery Sergeant (GySgt)	13 Years
First Sergeant/Master Sergeant (1stSgt/MSgt)	17.5 Years
Sergeant Major/Master Gunnery Sergeant (SgtMaj/MGySgt)	22 Years

Since these promotion selections are based on PMOS, those who are selected to the rank of Corporal and above, are promoted on the basis that they will meet the specific needs of the Marine Corps and further ensure that the skills of these individual Marines who are promoted are consistent with the vacancies in the force. In addition, enlisted grade structure reviews are conducted that ensure Marines are promoting at the TIS targets for each grade and that each PMOS is promoted on a pyramid-based structure. PMOS occupational field sponsors, Manpower and Reserve Affairs analysts, and the

⁸ Time in Service (TIS) refers to the amount of time in years/months that the service member has spent in military service. Conversely, Time in Grade (TIG) refers to the amount of time in years/months that the service member has spent in his current rank or grade.

Total Force Structure Division are charged with ensuring that the ever adjusting structure of the table of organization does not adversely affect the grade shape of respective PMOSs. The ultimate goal behind the ECFC Program is to balance the total inventory of Marines by grade and MOS to meet career force requirements. Continued implementation of these force management strategies ensures that commanders are provided with the right Marines by grade and MOS (MARADMIN, 505/10, 2009).

With this design background understood, in keeping with the best interest to the institution as a whole, it is apparent that the Marine Corps does not necessarily need or want everyone to be retained. However, Reserve manpower planners must be particularly precise when projecting continuation due to the specific complexities of nonrigid contracts and systematically different continuation behavior amongst reservists. It takes time to grow reserve Staff Sergeants and Gunnery Sergeants, etc. The Marine Corps needs to target those specific reservists who are the best candidates to grow and sustain a high-quality force and potentially adjust monetary incentives as a strategy to retain them. Due to limited funding, there is no effective monetary incentive plan that targets the necessary reserve population to continue service beyond their initial contractual obligation of 6 years. Therefore, close examination of continuation behavior of NPS 6x2 contracts is needed to inform the budget process.

5. Reserve Expectations

It is important to highlight that the fundamental premise surrounding the human decision-making process is that it relies heavily on individuals' expectations. Critical examination of reserve behavior with this in mind is both relevant and necessary. As Dolfini-Reed et al. (2005) point out, the expectations of individual reservists with respect to how much they will be mobilized in support of military operations play a unique role in their decision making. Therefore, when examining related behavioral patterns of Marine Reservists, one cannot simply compare reserve decisions with how the active-component makes decisions. By realizing the reserve population has systemic individual characteristics that are inherently different from the active component, it is fair to make the assumption that reservists have different expectations than those of active component

personnel, especially during certain time periods. Previous research conducted by CNA involving comprehensive reserve attrition across all services found that during the post-9/11 time periods, Marine Corps Reserve loss rates were higher than during periods prior to 9/11 (Dolfini-Reed et al., 2005).

Additionally, by examining loss rates over time, personnel inventory snapshots revealed that loss rates for recently deactivated⁹ reservists were higher than for those reservists who never activated. Over time, the “never activated” and “activated” groups began to follow the same trends, suggesting there was an initial reaction to the presidential call up of the reserves. Once this reaction diminished, reservists may have adjusted their expectations regarding their likelihood of activation, and therefore loss rates began to decline in both “the activated” and “never activated” groups. Even more interesting were those reservists who activated for 6 months or fewer and never were deployed overseas; they had higher loss rates than those who were activated and deployed (Dolfini-Reed et al., 2005). Reservists may be more likely to leave if they are disillusioned with the system. This lends credence to possible cultural factors associated with Marine Corps service, as well as how the “type of deployment” is perceived by the individual reservist as compared to their expectation of deploying or not deploying.

Studies by Dolfini-Reed and McHugh (2007) examined specific reserve component groups within the Marine Corps Reserve using both descriptive statistics and survival analysis. The results yielded similar results involving expectations with even more granularity. Deployment length seemed to be correlated with loss rates. Since September 11, 2001, 86% of those activated served 12 months or fewer, which was and still is currently the norm for involuntarily activated or mobilized SMCR units. Dolfini-Reed’s and McHugh’s findings indicated that those activations exceeding the 8–12 month period resulted in higher loss rates and most likely were related to expectations of the actual deployment length. When activations deviate from expectations, they result in

⁹ Deactivated refers to the period of time when a reservist returns to a normal reserve status after having just been either voluntary or involuntary activated in support of military operations. In the case of NPS reservists, this deactivation usually occurs with entire SMCR units which have just returned to CONUS.

higher loss rates. This marks a unique and relevant distinction with reservists' expectations of deployment and actual deployment experiences.

Lastly, given the unique dynamic of reservists juggling a full-time civilian job in addition to their reserve duty obligation, reservists self-select into continued service by weighing their taste for the job, along with time they are willing to spend towards their reserve duty obligations above and beyond their current full-time civilian careers. These factors can arguably differ in their weight on reservists versus those serving in the active duty forces. Thus, Figure 3 outlines the hypothesized expectations of a reservist based on the likelihood that he/she may be mobilized during the following three periods: Pre-9/11, Overlap-9/11, and Post-9/11.

The Pre-9/11 period isolates the years for those NPS reservists who enlisted during FY 1992–1995 and reached the 6-year decision point to continue service during FY 1998–2001, at the conclusion of their contracts. The Overlap-9/11 period isolates the years of those NPS reservists who enlisted during FY 1996–2001 and reached the decision point to continue service between FY 2002–2007. The Post-9/11 period will capture the years of those NPS reservists who enlisted during FY 2002–2003 and reached the decision point to continue service between FY 2008–2009. Throughout this thesis, these three groups are the basis for the statistical analysis used to further examine the various NPS continuation behaviors along with the specific effect of mobilization and deployment.

Pre-9/11 Time Period
No Expectation of Mobilizing/Deploying Those who enlisted during FY 1992 - 1995 and reached their decision point to continue service from FY 1998 - 2001
Overlap-9/11 Time Period
Transition Period (Unknown Expectation) Those who enlisted during FY 1996 - 2001 and reached their decision point to continue service from FY 2002 - 2007
Post-9/11 Time Period
Strong Expectation of Mobilizing/Deploying Those who enlisted during FY 2002 - 2003 and reached their decision point to continue service from FY 2008 - 2009

Source: Author

Figure 3. Hypothesized Expectation Periods

D. RESERVE ORGANIZATION AND FORCE STRUCTURE

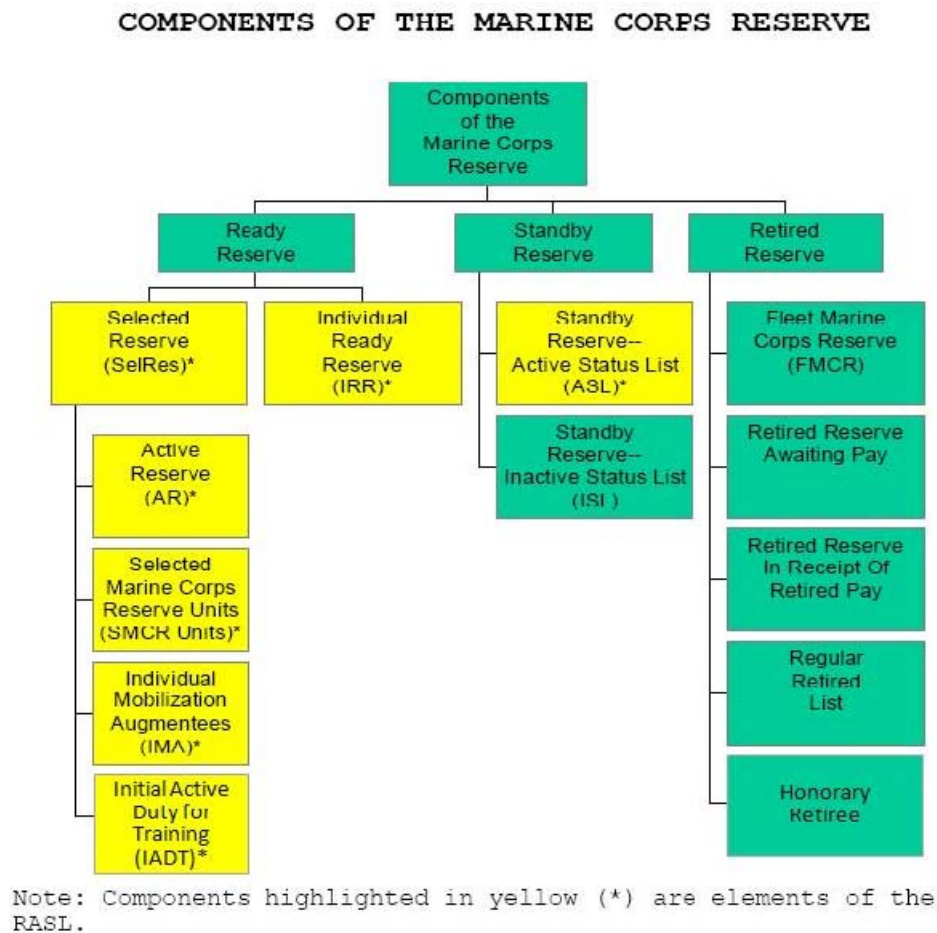
The mission of the Marine Corps Reserve is to augment and reinforce the active component with both qualified individuals and trained units during a time of national emergency, war, or when the nation's national security is at risk (MCO 1001R.1K, 2009, March).

By design, the Marine Corps Reserve not only compliments the total operating force structure and capabilities of the active component, but also carries the burden of being able to rapidly deploy and sustain at any level of recall or mobilization. This "total force integration," is the token theme for all reserve planning, training, and administration (MCO 1001R.1K, 2009, March). General Michael W. Hagee, the 33rd Commandant of the Marine Corps, summarized this theme in a speech given on April 6, 2004, to Marines deployed in Al Asad, Iraq:

All of the Marines have performed magnificently—both active and reserve, I can't tell the difference between an active duty and a Reserve unit out here which speaks highly of the Reserve units we have operating in our different areas of responsibility. The reserve Marines have

performed as outstandingly through OIF II as they did through OIF I. We, the Marine Corps, could not do what we do without them.

As depicted in Figure 4, The Marine Corps Reserve is categorized into three major components: the Ready Reserve, Standby Reserve, and Retired Reserve.



Source: MCO 1001R.1K, 2009, March

Figure 4. Components of the Marine Corps Reserve

1. Ready Reserve

The Ready Reserve is comprised of the Selected Reserve (SelRes) and the Individual Ready Reserve (IRR) and is organized to serve as the nation's crisis contingency during times of war or national emergency (MCO 1001R.1K, 2009, March).

a. *Selected Reserve (SelRes)*

The SelRes consists of the Active Reserve (AR), Selected Marine Corps Reserve (SMCR) units, Individual Mobilization Augmentees (IMA), and Marines undergoing Initial Active Duty for Training (IADT). Generally speaking, other than the AR, who serve full-time in jobs that support the overall reserve mission and integration of the Total Force and those Marines undergoing IADT, the SelRes members primarily consist of part-time drilling reservists. Most reservists fall into the category of SMCR units in which they serve by drilling one weekend out of the month and two weeks out of the year. IMAs are reservists who volunteer to augment specific active-duty job vacancies, which need to be filled in support of mobilization for either combat military operations or training roles (MCO 1001R.1K, 2009, March). The focus of this thesis is limited to NPS Marines in the SMCR units.

b. *Individual Ready Reserve (IRR)*

The IRR is comprised of those Marines who still have time remaining on their total Military Service Obligations (MSO) or have enlisted in the Ready Reserve, but are not required to participate in monthly drills, except to muster once a year. For example, if a reservist is serving on a MSO of eight years with a 6x2 contract, the first six years he/she is required to drill with SMCR units once a month and two weeks out of the year. However, at the completion of his/her 6-year drilling obligation, they can choose to drop to the IRR where they complete the remainder of their two years of MSO by only being required to muster up to once annually. They are not required to drill with a unit during this IRR period. This category primarily exists to provide a pre-trained pool of manpower available in the case of a presidential call up where members of the IRR can be easily recalled to service during this period if necessary. By comparison, in the active component, most first time enlisted contracts are 4x4 contracts, where the service member's first 4 years requires them to serve in an active duty capacity. At the end of their 4 years, unless they reenlist for another term, they would fall into their IRR period for 4 years where they would not be required to serve unless recalled in support of a

wartime or national emergency (MCO 1001R.1K, 2009, March). Marines who reenlist and choose not to continue drilling also fall into this category.

2. Standby Reserve

The Standby Reserve consists of reservists who are not a part of either the Ready or Retired Reserve and are unable or choose not to participate regularly. They are reservists who also fall subject to recall to active duty during time of war or national emergency, but at a lower cost of readiness and lower priority for mobilization. The Active Status List (ASL) of the Standby Reserve is primarily those reservists who have been unable to participate in the reserves on a regular basis due to civilian employment hardship or other personal issues. Members of the ASL still remain eligible for promotion and must complete their annual reserve point requirements in order to be retained in an active status, but are not eligible to receive monetary compensation. They are not required to train and are not members of units; however, they may be mobilized as needed to fill manpower requirements for specific skills.

The Standby Reserve Inactive Status List (ISL) consists solely of officers who have met their requirements of service obligation but failed to meet their minimum annual participation point requirements, and desire to remain affiliated with the Reserves or fail to respond to annual correspondence requirements. Reservists in the ISL are not eligible to receive pay, promotion, or retirement benefits (MCO 1001R.1K, 2009, March). Both the ASL and the ISL categories are not relevant to this study.

3. Retired Reserves

The retired reserves consists of those Marines who have either requested or been approved for retirement. This reserve category is not relevant to this study.

E. NONPRIOR SERVICE POPULATION

1. Accession Avenues

To further enrich the understanding of NPS characteristics, it is important to highlight the specific pathways that NPS reservists can take upon entering service into the Marine Corps. All NPS accessions may be categorized under one of four distinct Reserve Optional Enlistment Programs (ROEP)¹⁰ and the Reserve Incremental Initial Active Duty for Training (IIADT)¹¹ program.

a. *Reserve Optional Enlistment Programs*

There are four enlistment obligation options whereby all NPS accessions are contracted to serve in the Ready Reserve for an initial 8-year contract. Table 1 describes type and service requirements for each ROEP contract. As Table 2 outlines, the vast majority of these NPS accession requirements are fulfilled by 6x2 contracts. These 6x2 contracts comprise over 97% of the ROEP population and remain consistent in their representation over time.

Table 1. Reserve Optional Enlistment Program Contract Type

Contract Type	Contract Details
3X5	3 years drilling in the SMCR and 5 years remaining in the Ready Reserve
4X4	4 years drilling in the SMCR and 4 years remaining in the Ready Reserve
5X3	5 years drilling in the SMCR and 3 years remaining in the Ready Reserve
6X2	6 years drilling in the SMCR and 2 years remaining in the Ready Reserve

Source: Author

¹⁰ Reserve Optional Enlistment Program (ROEP) closely parallels the active duty enlistment options where an active duty recruit enters into service on similar contracts except in a full time duty capacity. The most prevalent first term active duty enlistment contract is a 4x4 contract, whereas the most prevalent NPS reserve contract under the ROEP is a 6x2 contract.

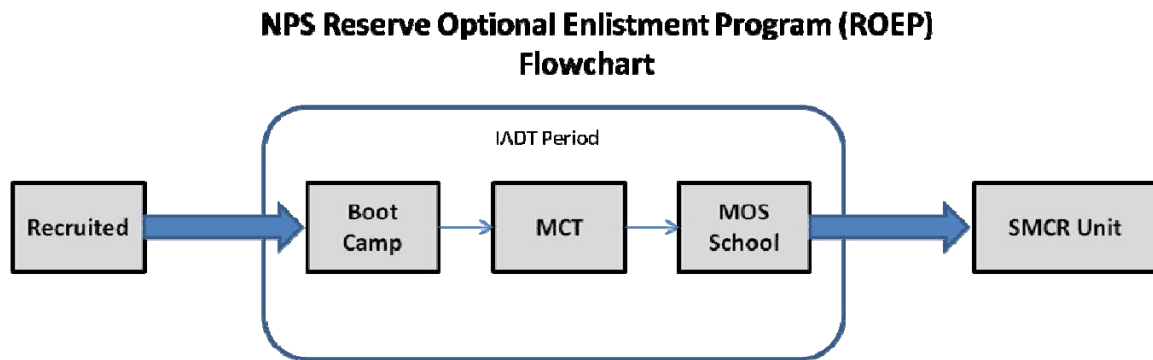
¹¹ Incremental Initial Duty Training Period (IIADT) is a contract option available to a reservist upon accession where he/she may complete the required training periods incrementally for boot camp and their follow-on occupation school; also referred to as “Split-I Training.” This is ultimately intended to help those reservists who have possible school- or employer-related constraints which require them to minimize the length of time they are away to train early in their contracts.

Table 2. Reserve Optional Enlistment Program Distributions (2000–2010)

Contract Type	30-Sep-00	Percentage	30-Sep-10	Percentage
3X5	54	0.20%	13	0.04%
4X4	510	1.90%	493	1.84%
5X3	20	0.07%	7	0.03%
6X2	25,414	97.75%	26,272	98.08%
Total	25,998	100.00%	26,785	100.00%

Source: Author, TFDW Data

To further illustrate the specific flow and path of those NPS reservists serving on 6x2 contracts, Figure 5 represents a graphical depiction of the typical accession path for an ROEP recruit. Notice that all IADT training is completed in sequence one after another prior to drilling with his/her SMCR unit.



Source: Author

Figure 5. NPS Reserve Optional Enlistment Program Flowchart

b. Reserve Incremental Initial Active Duty for Training (IIADT) Program

This program is specifically designed to target those who plan to enroll in college or currently are enrolled in college. It is designed to minimize the length of time that the reservist spends away from home at each stage of their initial training period and to further assist in balancing civilian commitments. Figure 6 represents the process of an NPS IIADT recruit. Typically, those qualified IIADT recruits will enter boot camp for their initial training shortly after high school graduation. Upon successful completion,

they return home to attend their first semester of college, unlike the normal ROEP enlistment in which recruits continue on directly to Marine Combat Training (MCT)¹² IIADT recruits, however, return home without attending MCT or the School of Infantry (SOI) right away. Throughout their first college school year, IIADT reservists are required to drill with their unit until the next summer break, when they attend MCT and/or Military Occupational School (MOS). In rare instances, the training pipeline occurs over three separate summers. While, commonly referred to as “Split-I Training” or “92-Day Reservists,” they only comprise less than 7% of all NPS reservist accessions.

NPS Incremental Initial Active Duty for Training (IIADT) Flowchart

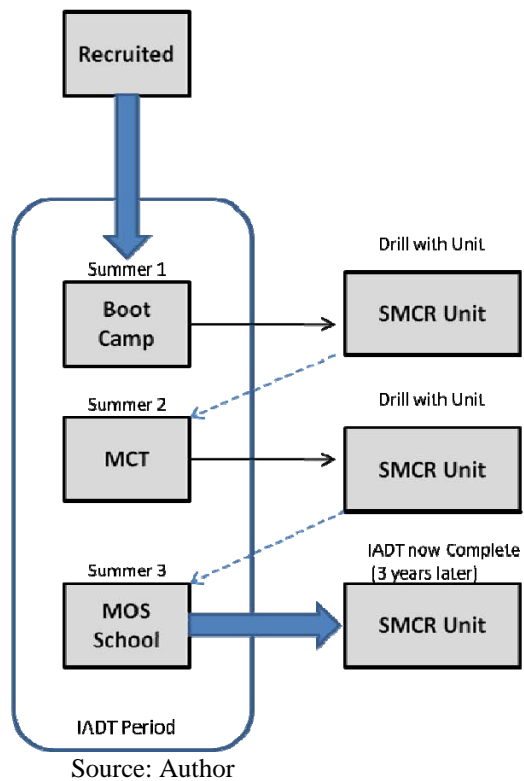
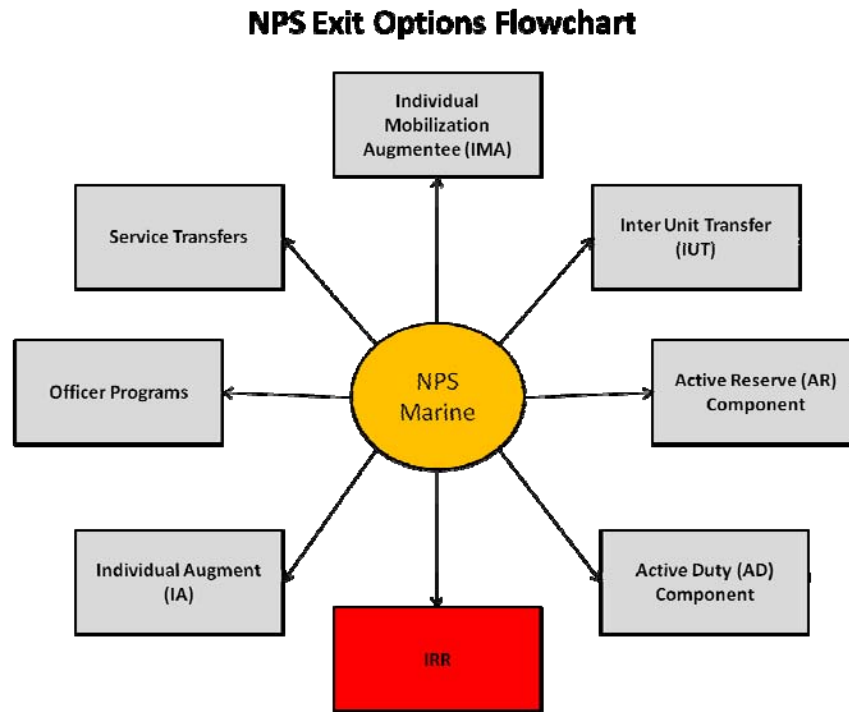


Figure 6. Incremental Initial Active Duty Training Period Flowchart

¹² Marine Combat Training (MCT) is a month long school required for all graduating boot camp recruits regardless of military occupational specialty. This school is designed to offer each individual Marine exposure, knowledge, and the ability to operate as a Marine Rifleman in a combat environment; hence, supporting the culture of “Every Marine a Rifleman.”

2. Exit Paths for NPS Reservists

NPS personnel have several choices that are available upon the completion of their mandatory drill participation period with their units. As Figure 7 indicates, there are several choices available for the NPS reservist.



Source: Author

Figure 7. NPS Exit Options Flowchart

It is important to note that not all exit options result in a loss for the SelRes. Specifically, those NPS reservists who choose the following paths do not result in a loss: the Individual Mobilization Augmentee (IMA) program, Inter-Unit Transfers (IUT), Active Reserve (AR), and those deciding to enter one of the Marine Corps Officer Programs. However, those NPS reservists who drop to the IRR and exit to other service transfers are considered a loss. Both current data trends, as well as previous research on NPS behavior patterns, suggest that most of the losses occur to the IRR. Conversely,

understanding these exit options that are available to the NPS reservists help provide the depth needed for later analysis of those reservists who chose to continue service.

F. RESEARCH SCOPE

In contrast to most previous reserve-focused studies, which primarily analyze mainstream defense topics centered around attrition and retention, this thesis examines the effects of mobilization/deployment on the likelihood of continuing service 12 months beyond the 6-year drilling requirement. Considering that only 19% of the NPS population continues beyond this point, it has been identified by Marine Corps Manpower Planners as a priority for analysis and considered a necessity for successful shaping of the future reserve force. A more detailed discussion surrounding this methodology will be provided in Chapter V.

G. ORGANIZATION OF STUDY

This thesis contains ten chapters in order to characterize the effects of mobilizations on NPS continuation rates. Together, Chapters II–IV provide thorough empirical research background within the literature review, theoretical model discussion, and social and psychological factors, which will establish the framework for analysis.

Collectively, Chapters V–VII define the data specifics, variable description, and descriptive statistics, which includes the preliminary research analysis for this thesis. Details within these chapters provide additional basis for model specification and multivariate regressions.

Chapters VIII–IX describe the statistical models and presents multivariate regression results. Statistical models will provide the explicit description for the various models utilized for regression analysis. The multivariate regression results chapter outlines the detailed results for each model used in the study. Lastly, Chapter X provides conclusions for this thesis and recommendations for future study.

II. LITERATURE REVIEW

A. INTRODUCTION

The preponderance of research regarding retention and attrition has been among studies that focused on the active component. However, there have been relatively few studies focusing on the reserves. Over the past decade, the main focus of reserve studies has centered on reserve intentions, attrition, and retention, but few have examined the actual drivers of reserve continuation behavior. Mainly, the federally funded research and development centers such as RAND Corporation and the Center for Naval Analyses (CNA) have produced the most substantial and comprehensive studies examining relevant and vital reserve topics.

The goal of this literature review is to examine more recent and relevant reserve attrition and retention studies, in order to further develop a theoretical basis for constructing a valid conceptual multivariate framework that assesses Marine Corps Reserve (MCR) continuation behavior.

1. Attrition

Attrition is defined as the separation of service prior to the completion of agreed upon contracted terms of military service. Within the military spectrum, first-term attrition has been studied significantly to further understand the specific and relevant time periods in which significant losses occur. Specifically, attrition is examined during initial training and occupational specialty schools, as well as throughout a person's obligated contract.

Defining attrition within the MCR is more challenging than analyzing attrition of the active component. This is due to the wide variety of service contracts available for Marine reservists. Initial drilling obligations range from 3 years to 6 years, while reenlistment contracts only obligate Marines to serve anywhere within the Ready Reserve

instead of SMCR units or the SelRes¹³. Additionally, some reservists complete their initial training requirements at a later time, as previously outlined in Chapter I Section E Reserve Overview for ROEP and IIADT. Furthermore, an individual loss within the SMCR does not always constitute a loss for the MCR since the reservist may transfer from one reserve participation category to another. These nuances that exist within the reserve community must be closely considered when analyzing various studies of attrition (Price, 2010).

2. Retention

Retention is defined as the voluntary decision of a person who has completed their initial obligation of service and chooses to remain in the military for additional term of service. Marine Corps Manpower and Reserve Affairs (M&RA) sets annual retention missions for the active component in Memorandum-01 (Memo-01) based on the percentage of Marines who reenlist at the end of their first and subsequent terms, more commonly referred to as alignment plans. These plans are formally known as the First Term Alignment Plan (FTAP)¹⁴ for the initial term, and the subsequent term alignment plan (STAP)¹⁵ for each additional term. Retention can be difficult to measure in the active component because not all Marines reenlist; rather, some extend for certain periods of time without formally signing a reenlistment contract.

For the MCR, manpower planners must examine retention through a different lens due to the nature of their unrestricted types of contracts. In general, Marines who reenlist in the reserves are only obligated to serve in the Ready Reserve (including both the

¹³ Beginning in the Fiscal Year 2011, M&RA has initiated a pilot program where up to 500 Marines will be given an incentive to contractually obligate themselves for an additional three-year period in the SMCR units after successfully completing their initial service obligation in the Selected Reserve or active component. Analysis of this program will not be complete prior to Fiscal Year 2014.

¹⁴ First Term Alignment Program (FTAP) is a retention program used by the Marine Corps which assists in the reenlistment of first term enlistees, by PMOS or via lateral move. It attempts to balance manpower staffing strengths by the vacancies of departing careerists and fill the spaces appropriately with those who are qualified to reenlist.

¹⁵ Subsequent Term Alignment Program (STAP) is intended to complement the FTAP by balancing the promotion pyramid in subsequent terms while reducing the overall FTAP requirement. It is designed to proactively target and reenlist career Marines by PMOS. Its purpose is ultimately to improve the retention of career force Marines while closely aligning promotion tempos across all PMOSs.

SelRes and IRR). Specific to NPS Marine Reservists, they can choose to stop drilling altogether at the completion of their 6-year drilling obligation, or can drill on a month-to-month basis after the completion of their 6-year drilling obligation while still contractually obligated to remain in the Ready Reserve. This unrestrictive and fluid non-contractual period further complicates the standard approaches to retention. A new tool designed to help manage this problem is a program similar to FTAP called the Obligor Alignment Program (OAP),¹⁶ which is tentatively scheduled for implementation during FY 2012.

B. ATTRITION STUDIES

1. Deployment Post-9/11

Dolfini-Reed et al. (2005) examined reserve attrition (all six reserve components of the armed forces) that has occurred since September 11, 2001 by using descriptive statistics analysis techniques. They developed a database that determined the number of completed and current activations for each reserve component by length and active duty period. A few years later, updated evidence by Dolfini-Reed et al. (2005), as reported in Chapter 4 of Winkler and Bicksler's (2008) book on the guard and reserves, identified that, as of June 2007, approximately 393,000 enlisted reservists had completed at least one active duty period in support of Operation Enduring Freedom or Operation Iraqi Freedom. This population accounted for over half of the total eligible population of reserve enlisted personnel that potentially could have been activated under the ongoing mobilizations since 9/11. This highlights the fact that enlisted members make up the preponderance of reserve mobilizations and that deployment magnitude and type are relevant when investigating reserve attrition.

Their approach involved calculating loss rates by looking 6 months past each reservists' deactivation month to see if that person still remains in the population,

¹⁶ Obligor Alignment Program (OAP) a new reserve alignment program designed similar to the FTAP for the active component. It attempts to balance the inventory of SMCR Marines by grade and MOS based on the needs of the Marine Corps. The OAP identifies the number of first-term Marines by PMOS that the Marine Corps must retain in order to achieve the requirements of the career force in each Reserve battalion.

signifying that they are still serving in the reserves. One limitation, which the authors point out, is that they were unable to test loss rates for those who were currently on activation status because those individuals do not have the choice of exiting service voluntarily. This will later become an important consideration in constructing the statistical model for this thesis on NPS continuation rates.

Dolfini-Reed et al. (2005) considered the individual's experiences during the period of activation, such as: (1) did the service member deploy overseas, (2) did he/she activate and not deploy overseas, or (3) did the person activate at all. Of the activated population, those who deployed overseas had a lower loss rate than those who were activated but stayed in CONUS. Also, the length of activation was important, with higher losses seen for those with longer periods of activation. Interestingly, multiple deployments seem to have no effect on reservist loss rates.

Specifically, MCR members had the highest 6-month loss rates of all the services, which increased significantly with the length of active duty period. This effect was even more pronounced in MCR members who were activated but never deployed.

An interesting conclusion can be drawn from these results. As mentioned in the background, Reservists' expectations of deploying and the type of deployment are particularly relevant when analyzing actual behavior; especially in the reserves, where service often comes second to their primary civilian occupations as a means of obtaining income.

Furthermore, deployment type, deployment experience, and the organizational culture of the specific service are all important factors to take into consideration. These are very difficult to infer from previous statistical driven studies, but by considering specific service attributes and missions, along with culture, they may provide a relevant lens for further analysis. Perhaps the rigor, deployment experience, and career expectations for Marines is vastly different from other services, which have different overall military missions.

Lastly, this analysis provided interesting reserve statistics across the Department of Defense, which revealed that overall loss rates of today are higher than Pre-9/11

period. However, there are differences in the loss rates within subpopulations of reservists and these are highly correlated with deployment status. One goal of this thesis is to reduce the specific noise associated with grouping all the Ready Reserve categories into a single population by exclusively examining retention behavior for NPS Marine personnel, while also restricting the data to Pre-9/11 and Post-9/11 periods.

2. Total Force Perspective

Attrition is an ever-present problem for both active and reserve component. Especially for the reserves, the attrition rate is known to be extremely high, which raises concerns for training losses. However, in the study by Sheila Nataraj Kirby and David W. Grissmer (1993), they take a closer look at reserve attrition during FY82 to FY88 and discover that as many as two-thirds of reservists who attrite, in fact come back to service or transfer to the active component or other active duty programs. They believe that attrition within the reserve forces should be analyzed with a “total force perspective,” where there is a lot of lateral movement (movement to the IRR or within different reserve service categories), which cannot be considered attrition and where training costs are not truly lost. The only real loss is when trained personnel permanently depart for full civilian life.

During the fiscal years analyzed from 1982–1988, the Marine Corps Reserve had the highest permanent reserve loss (35%) but this was still lower than the overall attrition of 60%, showing that 25% of reservists returned to service (same component, other selected reserve service, or active duty). The most important conclusions of their study were that a better measure for return on investment of training for a reservist will be their total participating years of service, instead of looking at their first break in service as a final attrition metric. Also, although true attrition (or loss to civilian life) rates may be lower than previously recognized, this still points to a problem of disorderly flow (in and out of service) where we could still be losing effectiveness and readiness within the reserve forces. Although this study is dated and examines a population of reservists serving in the 1980s, it marks a cornerstone in research design as it pertains to the reserves.

Similar implications were made in a recent study by Dolfini-Reed and Bowling, (2010) on their analysis of MCR recruiting and retention processes and policies. In this study, the authors suggested that the Marine Corps expand on its already existing total force perspective and utilize data mechanisms to identify specific demographic characteristics and relocation patterns of transitioning active component Marines. This information would provide manpower analysts with a more comprehensive understanding of the actual exit flow of active component Marines transitioning by rank, MOS, and geographic region to better inform the overall recruiting process. Perhaps, a portion of the active component mission could align with local Reserve unit MOS needs at the recruiting station. Similarly, this total force approach can be used for NPS Marines. Understanding the numerous characteristics of those who decide to stay or leave helps arm the overall recruiting mission with valuable information to help target key geographic regions and certain demographic populations near reserve stations and helps make the complex task of forecasting reserve accession more manageable.

This thesis will provide an extension of the total force perspective by identifying actual NPS behavior over the previous 15-year period. This thesis hopes to help manpower analysts synergize the Marine Corps overall reserve recruiting process.

3. Incentive Programs

Reservists are a unique group of military servicemembers, which requires a more in-depth approach when investigating their service behavior. Understanding the intricacies of how their professional civilian careers may affect their volunteer military service is of vital concern. In the volatile national security environment of today, reservists have proven to be an indispensable asset to our military, able to quickly augment the active component when needed. But how to best attract high-quality individuals and retain them within the reserve force has been a major concern. A study by Hattiangadi, et al. (2006) looked at a group of Marine Corps Reserve monetary

incentives categorized together under the Selected Reserve Incentive Program (SRIP)¹⁷ and found that these are valuable tools when it comes to retaining and recruiting quality individuals.

When incentives such as bonuses (enlistment or reenlistment) are given, Hattiangadi et al. (2006) found that reservists are less likely to attrite, possibly due to their obligation to return the bonus if the service is not completed or perhaps because these people had a higher sense of obligation before taking the bonus. In the Marine Corps Reserve before 9/11, only about 1% of 6-year obligors¹⁸ were given bonuses and this only increased to 2.5% after 9/11. For Fiscal Year 2011, this number has increased to 3.4% of the NPS mission, but at a reduced incentive amount of \$5,000 for a 6-year obligation. Although the MCR seems to have no problem in meeting their recruitment numbers, a large percentage of these attrite or discontinue service as soon as their obligation is complete. Increasing the scope and budget for these incentives could prove extremely cost-effective.

The Marine Corps has historically been very particular about their bonus policies, and recruiters are very reluctant to offer monetary incentives believing that the “intangible rewards” of becoming a Marine should suffice for any member of the Corps. Unfortunately, the MCR has the highest rate of attrition and likely loses a large number of talented individuals to the Army, which also seeks individuals with similar skills but can offer them substantially larger enlistment incentives and educational benefits.

When studying the continuation (or retention) of reservists, it is important to consider the incentives offered to Marines to continue service and/or reenlist. Although, bonuses and incentives were reviewed and upgraded in 2005, the MCR is still behind the other services in offering bonuses necessary to retain people with critical expertise in undermanned MOSs. Hattiangadi et al. (2006) make a solid argument that more bonuses may help with increased unit stability and continuation rates by enticing reservists to stay

¹⁷ SRIP provides monetary incentive payments for qualified Marines for enlistment, reenlistment, or affiliation with the Selected Marine Corps Reserve. Both NPS and Prior Service (PS) reservists may qualify for certain incentives.

¹⁸ Obligor refers to reservists who are currently serving under an obligated drilling requirement. The NPS population is considered obligors, whereas the prior service reserve population is not.

in the Reserve. This seems most relevant in the NPS population since their continuation rate for serving an additional year beyond the 6-year initial drilling obligations transition point is only 19%.

The authors discuss several potentially attractive reserve incentives, which may be targeted for better continuation such as: bonuses for enlisting in critical units, paid travel to drill sites, educational incentives such as loan repayment, bonuses for college credit or tuition assistance, and relocation incentives (to join certain units in need of certain MOSs since the location and population density of certain reserve sites are a continuous challenge).

The most important conclusion from this study is that bonuses work. They decrease attrition and help retain quality Marines serving in the reserves. The Marine Corps may be risking the loss of these individuals to other reserve component branches of the military by underutilizing incentives (Hattiangadi et al., 2006).

C. RETENTION STUDIES

While attrition studies are vital in determining demographic and other factors that are related to the service members not fulfilling their obligated contracts, retention studies are of equal importance in assisting analysts in determining the various factors associated with service members staying beyond their obligated service contracts. The following studies provide some relevant background for reserve retention behavior.

1. Deployment Tempo

Dolfini-Reed and McHugh (2007) examined the effects of deployment tempo on SelRes retention by using descriptive statistics to depict varying size and composition of SMCR enlisted and officers over time. They also described specific patterns in activation and deployment since September 11, 2001. Lastly, they used survival analysis to determine the effect of activation on a reservist's decision to stay affiliated with SMCR units.

While various patterns were analyzed, the Dolfini-Reed and McHugh (2007) study revealed some interesting findings specific to NPS reserve personnel. Specifically, NPS take cues from activation *potential* even prior to their actual activation. For example, NPS personnel, which fell into the categories of the most heavily activated MOSs, were more likely to leave before being activated than those reservists who are in MOSs that were less activated. Interestingly, this behavior was exclusive to NPS personnel, as it did not hold true for prior-service reservists and reserve officers. Also, among the paygrade levels, E-5s were the most likely to leave the SMCR, according to Dolfini-Reed and McHugh. It is noted that the most likely reason for this is that the more junior paygrades of E-1 through E-3 are usually new joins and have not yet matured in their contract obligations to be at the decision point of staying or leaving.

In terms of demographics, holding all things constant, NPS blacks had a 34% higher risk of leaving than whites and Hispanics had a 20% lower risk of leaving than whites. NPS females had a higher loss rate than NPS males. Further, the number of dependents of NPS personnel had significant affects on loss rates. As compared to Marines with no dependents, NPS Marines who had 1–2 dependents were 40% more likely to leave, those with 3-4 dependents were 55% more likely to leave, while those with 5 or more dependants were over twice as likely to leave as those with no dependants. This demonstrated a trend for the time period analyzed in the study from 2001–2006: as the number of dependents increased, the probability to leave also increased (Dolfini-Reed & McHugh, 2007).

Again, an important finding was uncovered with respect to loss behavior before and after September 11, 2001. During the first 16 months following 9/11, NPS enlisted Marines had higher loss rates prior to September 11, 2001. Loss rates after January 2003, showed a marked decrease suggesting that servicemen were more likely to remain in service. The authors point out that NPS Marines who were affiliated with the SMCR during periods where deployment expectations were clearer seemed to be linked with increased retention. Marines who joined after 2003 may have clearly expected to be deployed in support of Operation Iraqi Freedom (Dolfini-Reed & McHugh, 2007). As

mentioned above in the background section, researchers must consider expectations, which warrant future methodology considerations when studying reserve behavior.

2. Intangible Factors of Retention

As previously described, monetary incentives can play an important role in the reenlistment of qualified personnel, and as the armed forces continuously becomes more dependent on an operational reserve, it is essential to understand all the factors that motivate reservists to continue to serve. Some researchers argue that there are many relevant factors other than monetary incentives that need to be explored in order to better understand the behavior of reservists, and to determine which factors are truly important for them when considering reenlistment or continued affiliation.

Grissmer et al. (1992) introduced how the attitudinal variables and unit environment affect reserve reenlistments. They predicted that reserve participation numbers would grow over time and the active component's dependency on the reserves would be immense, even to the point of replacing large portions of the active component for certain military roles and functions. They pointed out that the Army already depends on its reserve forces for over one half of all its wartime needs. However, because reservists have full civilian lives and are only serving in the military part time (one weekend a month and two weeks a year), there are real concerns with combat and unit readiness. One may argue that with today's operational and deployment tempo, the organizational health of the reserves should be first priority.

Grissmer et al. (1992) recognize that some of the same basic factors that affect civilian moonlighting, such as choosing to take on a second job and the possible monetary gains that will be received are at play in reservists. Still, it is important to note that military reserve service is very different from civilian moonlighting jobs (which will be covered later in the theoretical model chapter). In general, reserve schedules are inflexible and can conflict with important family and job-related events. Also, although reserve service is protected by law, they place a large burden on some employers, which makes it hard to positively support their employees. However, in contrast to moonlighting theory, there are also benefits not available in typical moonlighting jobs

such as retirement benefits, valuable training, bonuses, and job security. Also there are intangible benefits that are highly valuable to some such as patriotism and serving one's country.

Using bivariate relationship models, Grissmer et al. (1992) analyzed data from the 1986 survey of enlisted personnel and common personnel data obtained on reserve components by looking forward in time (focusing on servicemen at early or mid-career and at the end of their enlisted term of service). As a result, they were able to determine that employer attitudes, spousal attitudes, and unit satisfaction were important in reservists' decision to reenlist. The study determined that about 15–20% of supervisors had negative attitudes towards reserve service and this attitude could result in lower wages, lower rates of promotion, etc. Local government jobs such as policemen had the most unfavorable attitudes possibly due to the difficulties posed to managers with shift schedules. Servicemembers with jobs in the private sector had the highest loss of wages due to their reserve obligations. When the relationship was analyzed using a bivariate model, it was found that servicemembers of employers with very unfavorable attitudes choose to reenlist at a rate of 68%, while those with employers with favorable attitudes had a rate of 79.3%.

Spousal attitudes, on the other hand had a much larger effect on reenlistment rate. Those with spouses that had very unfavorable attitudes reenlisted at only 42.1% rate, whereas those with supportive spouses reenlisted at an 85.1% rate. Younger servicemembers were more affected by spousal attitude than more senior personnel, possibly due to younger reservists choosing not to continue if their spouse had a very negative attitude. Dissatisfaction with their specific units, due to poor training, equipment and morale was also found to have a small but significant effect on reenlistment. Conclusions from this study point to spousal attitudes as the most important factor affecting reservist reenlistment, followed by civilian employer attitudes and unit satisfaction.

It is, however, important to realize that the data is based on *perceived* attitudes and many times the survey data was not reflective of actual reenlistments; in fact, actual reenlistment rates were much higher than the survey data showed. Still, it is important to

take into consideration these attitudinal effects and possibly base new policies and programs that will help increase positive spousal attitudes (via family and support programs), employer attitudes (with tax deductions for employing reservists and other support programs), and provide better support to reserve units with better equipment and training facilities. All of these would serve to increase the rates of reenlistment, which would help retain qualified individuals and increase reserve unit morale, while at the same time lowering training costs.

D. CONTINUATION STUDIES

Although retention and continuation are interrelated, they are not the same. Continuation studies focus not just on whether a person is retained in service at the completion of their contracts, but rather, of those individuals that did remain, did they end up continuing service at various points in time beyond their contracts. It can arguably be the most preferred approaches when examining reserve behavior since reservists have such unrestrictive reenlistment contracts, which contrast to those of the active component. There have been very few selected reserve studies that have utilized this continuation rate focus.

1. Reserve and Guard Continuation

Hansen and Macleod (2004) focused their study on retention in both the reserve and guard components with a continuation rate methodology by utilizing logistic regression estimates on the probability of remaining in the Selected Reserve. More specifically, they defined continuation rate as the proportion of Selected Reserve members from FY 2000–FY 2003 who chose to renew their reenlistments and remain in the reserves. As with many studies discussed in this chapter, their analysis provided many relevant factors that analysts should consider when studying reserve retention behavior such as: demographics, education–level, paygrade, length of military service, geographic location, local economic conditions, and occupational specialties. Of these, it

is important to note that although relevant to retention-focused studies, they found that local economic conditions such as state unemployment rates were not the primary drivers for continuation rates.

Some primary drivers were education–level, occupational specialty, and geographic location. Retention increases with level of education until reservists reach the point at which they obtain college degrees. This suggests that many reservists have the propensity to stay while attending college or technical schools. This strongly implies that a challenge for reserve forces is to continually compete with the private sector for highly educated people. Another distinction was that certain occupational specialties may experience lower continuation rates because their civilian earning opportunities are simply higher. Furthermore, when examining geographic location, they suggest that regional staffing difficulties and reserve unit densities in certain areas may account for skewing the results and adding difficulty in their specific interpretation, but offer planners some depth in closely considering the multitude of factors that may exist relative to reservists serving in particular regional areas.

Lastly, data restrictions constrained the authors’ ability to control for those reservists who were activated, mobilized, or deployed at any point during the fiscal years covered. Another limitation was that the metric of reenlistment did not fully measure complete continuation behavior since those reservist who chose to continue service may have extended or continued to participate without actually reenlisting.

2. Navy Reenlistment Bonus and Continuation

Lien (2006) analyzed the effects of enlistment and reenlistment bonuses on continuation rates in the Navy Selected Reserve by using Reserve Component Common Personnel Data System (RCCPDS) data from October 1999 to March 2005. Through various logistic models, she determined various impacts of a bonus on sailors’ decision to reenlist. Among those results, she found that NPS reservists who were in receipt of an enlistment bonus had increased their 12-month continuation probabilities by 12% (or 8.9 percentage points), and for 24-month continuation rates by 26% (or 14 percentage points). Also, of those who were eligible for a reenlistment bonus, only 32% of those

reenlisting actually took the bonus. This suggests that the bonus awareness of Sailors is either low, or it could be that reservists are reluctant to accept the bonus since it would add additional constraints to their reserve service, as indicated from previous MCR studies.

3. Marine Corps Prior Service Continuation Rates

Price (2010) used a continuation model for estimating the effects of activations on the Prior Service SMCR unit population and found that a positive relationship existed between activation and continuation; though, this effect rapidly became negative as the length of activation increased. He used probit models to estimate 12-month continuation rates for both prior reserve component and prior active component Marines serving at various tour length intervals (4, 12, and 24 months). He was able to control for bias in the parameters for those individuals who may have been currently deployed and unable to exit service by looking at 12-month continuation rates. His models included previous relevant variables used in prior research, such as: demographics, monetary incentives, unemployment rate, military ability variables, fiscal year effects and AFQT¹⁹ score. Additionally, he created a model that was designed to identify certain effects of military knowledge, skills and abilities (KSAs), which provide a starting point to further examine non-prior service attrition and continuation behavior.

E. SUMMARY

This review of the literature has attempted to capture the most relevant reserve studies to date. Now, more than ever before, reserve studies are becoming a high priority since the Iraq and Afghanistan conflicts have demanded so much reserve force support over the past 10 years. This brief literature review has provided a basis for the central themes that are essential to reserve behavior. It also marks the clear distinction of how

¹⁹ Armed Forces Qualification Test (AFQT) is an aptitude test which generates a composite of four core written tests given to new military recruits which measure knowledge across a group of typical high school- level academic disciplines. Scores are categorized into groups which indicate high quality and low quality recruits. AFQT categories 1-3A are considered high-quality recruits and AFQT categories 3B and below are considered low-quality.

and why certain techniques of attrition and retention focused studies are used and why. Several conclusions can be made from this review.

- A total force perspective should be utilized when studying reserve behavior.
- Deployment tempo has significant effects on whether a reservist continues service inside their contract, and longer periods of activation also result in higher loss rates.
- Enlisted members make up the preponderance of reserve deployments.
- Mobilization characteristics are relevant to consider given the potential expectation to deploy outside the continental U.S. (CONUS) post-9/11. Current evidence supports that those who do not get deployed overseas have higher incidents of loss rate behavior.
- Monetary and educational incentives and their effect on MCR retention should be considered. Studies suggest that offering more bonus options for reenlistment to include both higher monetary bonus payout, as well as, more bonus programs available for reservists to use, may help increase reserve continuation.
- Comprehensively, several common relationships exist to include: demographics, education–level, paygrade, length of military service, geographic location, local economic conditions, fiscal year effects, and occupational specialties.
- Intangible factors such as spousal and employer attitudes toward service, dissatisfaction with specific units, morale, leadership, and poor unit cohesion are relevant to consider when studying reserve retention and very difficult to measure using multivariate econometric models, which rely solely on observational data.
- Valid model choice and statistical approach is crucial in estimating the effects of attrition, retention, or continuation. Continuation rate models seem to provide a better approach for examining reserve specific retention behaviors verses standard retention approaches.

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III. THEORETICAL MODELS OF RETENTION

The following sections consider theoretical models from an economic perspective. Each model will be reviewed for its relevance to the retention behavior of reservists. Section A will analyze the Annualized Cost of Leaving (ACOL) model, which considers the net monetary returns to continued military service. Section B will present the Expected Utility of Deployment model, which considers the monetary effects combined with the probability of deployment duration. Section C will consider Moonlighting Theory as an explanation for reserve behavior.

A. ANNUALIZED COST OF LEAVING

The Annualized Cost of Leaving (ACOL) model brings into consideration an individual's civilian earnings versus military earnings and the expected decrease in earnings as a result of leaving. Additionally, it considers unemployment rates and net preference for civilian versus military life. A notable aspect of the ACOL model is that it accounts for the number of years previously spent in the military and, therefore, loss of time and experience needed for civilian employment. Hansen and Wenger (2005) summarized the ACOL model, which predicts that an individual will continue serving for y additional time so long as the following holds true:

$$\sum_{i=t+1}^{t+y} \frac{M_i}{(1+r)^{i-t}} > \sum_{i=t+1}^{t+y} \frac{C_i + \tau}{(1+r)^{i-t}}$$

where,

t = Years of Previous Military Service

y = Years of Service Beyond Present

M_i = Expected Military Compensation for the i -th Year of Service

C_i = Expected Civilian Compensation for the i -th Year of Service

r = Real Discount Rate

τ = Individual Relative Preference for Civilian vs. Military Employment

As can be seen from the model, an individual's "taste" for civilian employment is considered in the model as a negative factor in military continuation and is combined with their expected civilian earnings for the given year. In contrast, the expected military compensation is a positive factor in military continuation. The ACOL model predicts that an individual will remain in service so long as the individual's benefits from military employment exceed those benefits yielded by civilian employment, where net benefits incorporate the individual's taste for each occupational option.

Over the time covered in this specific study, unemployment rates and possible monetary benefits of deploying could increase an individual's likelihood of military continuation based on the ACOL model. For example, if a reservist is unemployed or facing static civilian earnings for the future year, or some future period, there is a stronger probability of continuation.

During the Overlap-9/11 time period, it is hypothesized that the expectation of deployment is undetermined and therefore the "taste" for military employment may not be as strong of a factor. In comparison, for the Post-9/11 period, it is hypothesized that deployment constitutes a strong expectation and therefore the "taste" for military employment has become very specific. Consequently, the effect of τ could have increased during the Post-9/11 period.

In summary, the ACOL model helps describe the net expectation of a reservist's continuation as based on their expected monetary benefits and the individual's tastes for military and civilian employment. This model helps provide a foundation for specifying the multivariate models that will be estimated in this study.

B. EXPECTED UTILITY OF DEPLOYMENT

Another relevant model to consider is the Expected Utility of Deployment Model. As shown below, this model brings into consideration an individual's income, duration of deployment and duration of time between deployments.

$$EU = (1 - p)U(m, 1, 0) + p \int_{\mu - \delta}^{\mu + \delta} \frac{1}{2\delta} U(m + \omega d, 1 - d, d) \delta d$$

where,

- p = Probability of Deployment
- m = Base Pay
- ω = Amount of Deployment Pay
- d = Deployment Time
- δ = $(d_2 - d_1) / 2$
- μ = $d_1 + \delta$

In this formulation, d_1 and d_2 represent the minimum and maximum deployment times, respectively and therefore μ represents the mean deployment time. It should be noted that $\frac{1}{2\delta}$ represents the probability density for the uniform distribution during the deployment interval. The expected utility while deployed is given by $U(m + \omega d, 1 - d, d)$ (Hosek et al., 2006).

This model incorporates deployment time, as well as the probability of deployment in contrast to time spent at home (not deployed). It is important to note that the model does not allow freedom for personal selection of the parameters and therefore the time deployed may differ from the preferred deployment duration. Consequently, an increase in μ can result in either an increased or reduced expected utility depending on the actual preferred mean deployment time. For example, if a reservist has a preferred deployment time μ^* and $\mu < \mu^*$, then an increase in μ would result in a higher expected utility. Conversely, if $\mu > \mu^*$, then an increase in μ would result in a lower expected utility. It can be hypothesized from this that too great an increase in μ above μ^* may negatively affect continuation. The observation below from Hosek et al. (2006, p. 9) underscores the importance of considering the Expected Utility of Deployment model while developing a theoretical framework for this analysis on NPS reservists:

current realization of deployment causes the individual to revise the estimates of p , μ , or δ ...[and] could affect expected utility. For instance, expectations about the frequency and duration of deployment may have changed markedly because of the operations in Iraq and Afghanistan.

In consideration of this observation, the above model forms a vital part of our analysis of continuation among NPS reservists, particularly with respect to deployment and mobilization.

C. MOONLIGHTING THEORY

Moonlighting Theory is the traditional concept that reserve enlistment decisions are virtually indistinguishable from other civilian decisions on holding a second job. If this is the case, labor supply theory on moonlighting should be a strong consideration in this analysis of NPS reserve continuation.

Previous research has suggested that civilian moonlighting intrinsically differs from reserve participation. Several factors contribute to this as discussed by Arkes and Kilburn (2005, p.13):

Extensive training required for the reserves (having an effect on the time costs and the training benefits of participation), the priority their reserve participation can take over their primary job, the job security of the reserves, and many of the nonmonetary benefits of participating all serve to make the decision to participate in the reserves much more complex than the decision of whether to moonlight beyond one's primary job.

Another major difference between moonlighting and reserve participation noted in Fugita and Lakhani (1991) is the flexibility of hours. It is assumed that a moonlighting individual can select hours for the secondary job whereas reserve participation does not allow for such flexibility.

In a further test of the applicability of the theory of labor supply to moonlighting (second jobs) and its relevance to reserve behavior, an in-depth analysis by Mehay (1991) statistically analyzed the hypothesis that the two categories were behaviorally identical. This study utilized a logistic model that considered a cross comparison of an individual's choice to work only one full-time civilian job, one full-time primary civilian job with a

second civilian job (moonlighting), or one full-time primary civilian job with simultaneous reserve participation. Statistical analysis demonstrated that there was a significant difference between moonlighting in addition to a full time job and reserve participation in addition to a full time job. Particularly, underemployment on the main job was not a primary factor associated with reserve participation (Mehay, 1991). Economic factors, such as age, education, and economic status were found to be relevant in the cited study.

In consideration of other moonlighting research it is logical to assume that civilian job moonlighting theory does not provide a firm basis for specifying models of military reserve participation. In consequence, this research will not use labor supply models as a theoretical basis specifying a reserve behavioral model.

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IV. SOCIAL AND PSYCHOLOGICAL FACTORS

The preponderance of research over the last 20 years has focused on two central themes, *organization commitment* and *job satisfaction*. Most theories applied to these themes examine them with great detail in search of potential causes linked to retention and turnover such as pay, benefits, repetitive work, coworker influences, fairness, recognition, work-family conflicts, time spent away from home, promotional opportunities, and other job alternatives, to name only a few. Additionally, numerous theorists have made major gains in research investigating other indicators that may lead to job dissatisfaction, such as attitudinal factors. Attitudinal factors are perceived attitudes from supervisors towards their employees, or spousal attitudes. Empirical research in these areas suggests three common denominators serve as antecedents for job satisfaction and organizational commitment. Those three antecedents are: (1) Structural: individual based characteristics, (2) Environmental: institutional/organizational related influencers, and (3) Personal: external influencers such as primary civilian occupation and family impacts.

In order to focus this vast selection of literature as it relates to Marine Corps Reserve retention behavior, this chapter will draw from the results of two recent Marine Corps Reserve retention surveys conducted in 2009 and 2010, and will incorporate those key findings as they pertain to various job satisfaction and organizational commitment literature²⁰. This discussion will guide and align social and psychological areas of importance by organizing the key survey results and key literature topics into the three antecedent influence areas of structural, environmental, and personal.

²⁰ The Marine Corps Reserve Retention Surveys of 2009 and 2010 analyzed 3,820 responses and 3,113 responses, respectively, to a 96 question online survey initiated by M&RA, Quantico, VA. These surveys summarized reservists' continuation intentions and unobservable attitudes or trends affecting continuation decisions. Approximately 83% of respondents were among the ranks considered in this thesis (E-1 through E-5).

A. STRUCTURAL FACTORS

Structural factors are those which include group dynamics, interpersonal relationships, job hazards of deployment, and leadership as they pertain to the reservist.

1. Reasons for Joining the Reserves

In assessing the potential reasons why a person would join the reserves, it is important to note that these reasons may not only vary on an individual basis, but also appear to vary across the different service branches. Although this analysis is aimed at “reserve” continuation decisions and behavior, it is notable that those who join the Marine Corps Reserve appear to have the most intrinsic motivations as compared to the other services. Fugita and Lakhani (1991) point out Marine reservists tend to affiliate due to more intangible benefits rather than monetary incentives. Specifically, from a presentation given by Mark C. Regets (1990), he described that, “in a 1975 survey of non-prior service Marine Corps reservists, 67% listed “to be a Marine” as an important motivation for joining versus 41% for pay” (As cited in Fugita & Lakhani, 1991, p. 5). This need for affiliation will be discussed further as it is relevant to retention with more recent research in McClelland’s Learned Needs Theory below.

2. Monetary Incentive

According to the Report of the Presidents Commission on an All-Volunteer Force (1970) in the early years of designing strategies for an “All Volunteer Force”:

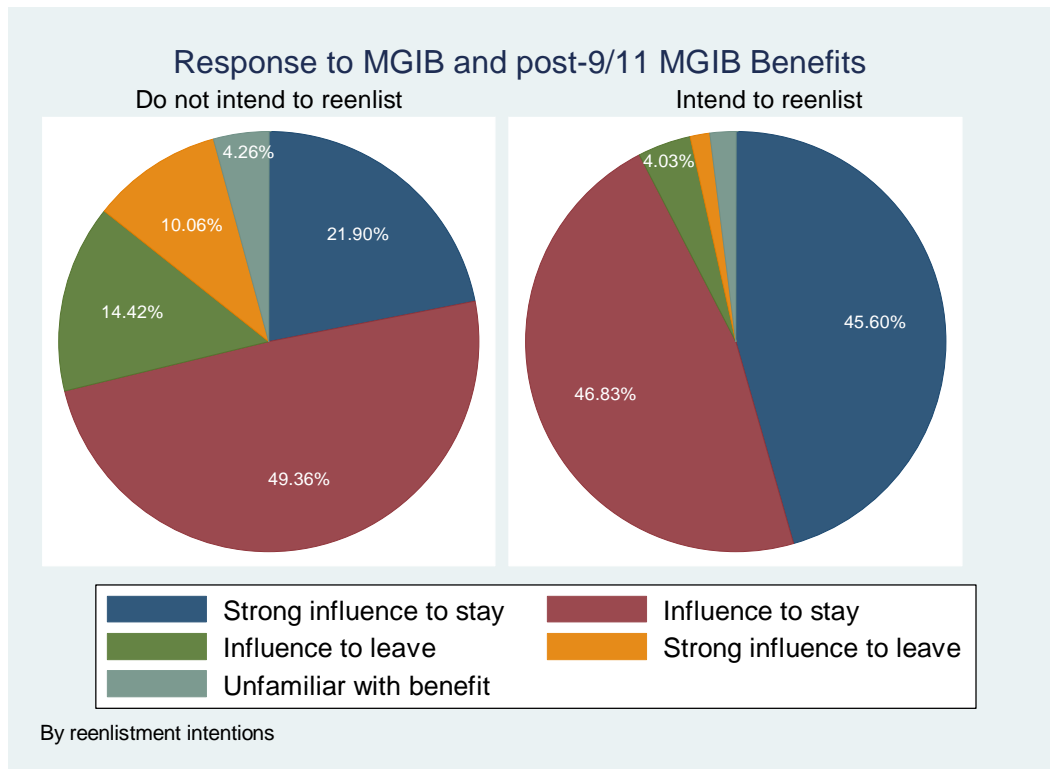
Military compensation in the early years of service is now so low that it will not sustain an all-volunteer force of the quality desired. Until that condition is corrected, an all-volunteer force cannot be realized. (As cited in Rostker, 2006, p.82)

Military sociologist Charles Moskos asserted that the archetypal model of viewing military from the previous draft era *institutional model* whereby military service was closely aligned with more value driven service choices such as “collective good,” has now shifted to a new paradigm model built upon an *organizational format*, which more closely aligns with the civilian marketplace. As a result, military members started

identifying less with serving for a higher cause or good and motivated more to serve with self-interests and monetary rewards in mind. Therefore, procuring better retention sparked a divide in two competing schools of thought, *utilitarianism*, which bears a resemblance to the organizational format versus *collectivism*, which is more closely aligned with the institutional format (Moore, 2002, p.261). These competing ideals still exist today. It is very possible that currently in the Post-9/11 period that there could be an increase in the ideals associated with the institutional format following the events of September 9/11. However, considering the Post-9/11 economic downturn and recent recession, individuals are likely motivated by some monetary aspects.

Since then, each service branch has incorporated an unparalleled amount of monetary incentives such as pay, educational benefits, and other incentives to include enlistment and reenlistment bonuses. These expenses have been incurred by the military in an effort to successfully attract qualified individuals from the civilian job market (Moore, 2002).

For reservists, whose time is mostly spent in the civilian labor market, pecuniary influencers appear even more relevant motivators for continuation than the active component and reservists may be more responsive to increases in pay and other benefits associated with their service. The results from the 2010 Marine Corps Retention Survey support this notion; 78% of respondents who were unlikely to reenlist stated that monetary incentives were a strong influence to stay. Additionally, reservists in the survey responded that both traditional Montgomery G.I. Bill (MGIB) and Post-9/11 educational benefits were strong influencers for retention. Figure 8 shows MGIB benefits results on Marine reservists' intentions to stay or reenlist.



Source: M&RA, RAP, Quantico, VA., 2010 Reserve Retention Survey Results Analysis

Figure 8. 2010 Reserve Survey Results for MGIB Influence on Intention to Reenlist

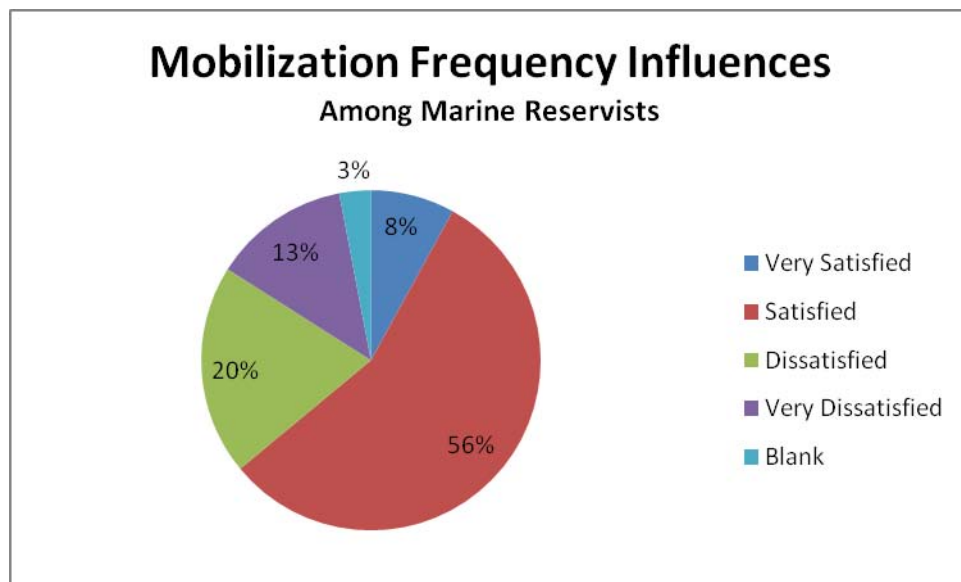
Of respondents who did not intend to reenlist, 71.3% stated that MGIB or Post-9/11 educational benefits was a strong influence to stay; and among those who did intend to reenlist, 92.4% reported that these benefits were strong influencers to stay. Based on these statistics, monetary incentive and educational benefits appear to provide a strong incentive among reservists to continue in service.

3. Job Hazards

Military mobilization/deployment can be viewed as a type of job hazard that individuals serving in the military must confront. Previous research has indicated that deployments can have both positive and negative impacts on retention, which has been extremely difficult to interpret. Additionally, it has not been until recently, over the past 10 years, that researchers have had the opportunity to estimate specific deployment effects on the active and reserve component forces. As certain economic utility

maximizing models offer legitimate discussion with respect to certain tastes for military service, examining deployment effects from a social and psychological perspective is also relevant. Previous job satisfaction studies have indicated that as an individual's job complexity and quantitative workload increases, job satisfaction decreases. Similarly, job attributes in the military, where additional job complexity and work load increase (such as mobilizations), may contribute to an individual's retention decision. Most importantly, however, job stressors affect people in different ways. This makes the analysis of how mobilization affects certain military members, and their propensity to continue service, problematic. Each person is affected differently by stress coping abilities (Hosek et al., 2006).

The 2010 Marine Corps Retention Survey yielded some interesting results that pertain to this discussion. Figure 9 shows the respondents' opinions on their mobilization frequency.



Source: M&RA, RAP, Quantico, VA., 2010 Reserve Retention Survey Results Analysis

Figure 9. 2010 Reserve Survey Results for MGIB Influence on Retention Intention

Although 64% of Marines who responded indicated being satisfied with their mobilization frequencies, this contradicts most empirical research that commonly links negative retention effects associated with mobilization. This highlights the complicated

nature of establishing the effect of deployment. However, these responses may be affected by the specific time period in question; most empirical research is only available for the Overlap-9/11 period or before, when the lack of expectation on mobilization may explain the negative effects of an actual mobilization. In contrast, these surveys were conducted with responses from the Post-9/11 period enlistees, who may have had an expectation of mobilization and, therefore, reported a positive satisfaction with mobilization frequencies.

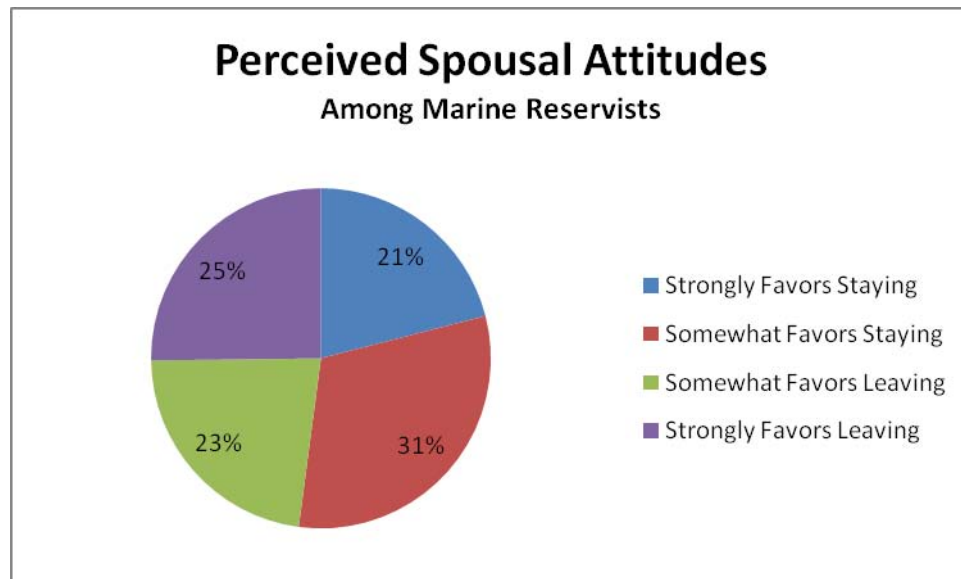
When looking at deployment through the lens of how the experience of time away from home influences individuals, it may be possible to uncover the potential dominating factors that influence deployment that are nested within the deployment experience itself. According to the 2010 Marine Corps Reserve Retention Survey, 74.8% of respondents indicated that they are satisfied or very satisfied with their time away (75% in FY09). Consequently, factors upon reservists' return home should be considered, such as demobilization and the potential loss of unit cohesion. For example, if reserve Marines demobilize and return to a climate where cohesion rapidly dissipates as they re-enter civilian life, they may be less satisfied than prior to the mobilization or while mobilized. In turn, reduced satisfaction may reduce continuation. Therefore, it is possible that mobilization has a positive impact on retention while demobilization has a negative impact.

B. ENVIRONMENTAL FACTORS

1. Role Conflict: Spouse and Family Influence

Previous active duty studies explain that military service in general demands a great deal of time spent away from home either with routine training, preparation training for deployments, or with the actual deployment itself (Quester et al., 2006). Arguably, for the reserves, the strain and demand placed on them may produce even more spouse and family conflicts since it may be fundamentally expected (by family members) that their reserve roles are part-time (1-weekend out of the month).

Interestingly, a large portion of respondents to the same survey indicated that their spouses “favored their leaving.” Figure 10 shows the perceived spousal attitudes as self-reported by obligors in the 2010 Reserve Retention Survey.



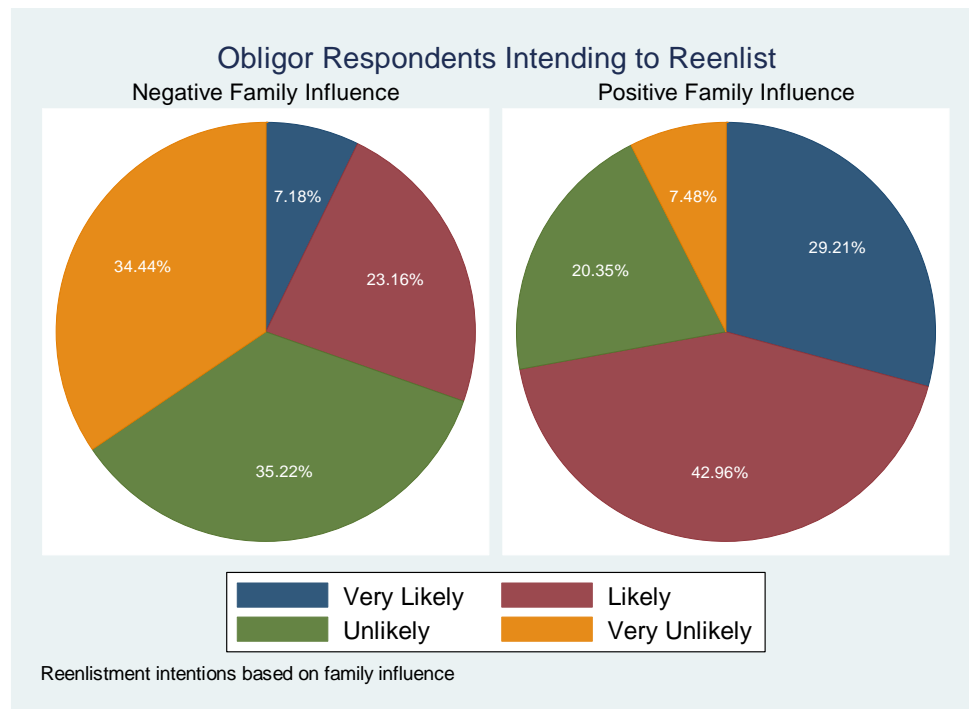
Source: M&RA, RAP, Quantico, VA., 2010 Reserve Retention Survey Results Analysis

Figure 10. 2010 Reserve Survey Results for Spousal Attitudes on Intention to Reenlist

As shown, nearly half of the respondents indicated they believed their spouses would prefer them to leave the reserve force. Several factors could explain the spousal factors reported. It can be hypothesized that the combination of increased maturity and responsibilities over time plays a large role in this expected trend. For example, a reservist’s spouse may expect less absence and more focus on the primary job—particularly if the civilian job already demands a great deal of time requiring substantial absence.

According to the Theory of Planned Behavior discussed in Weiss et al. (2002), an individual’s behavior can be closely predicted by considering influencing factors such as the individual’s perception of control over the behavior and the subjective expectations of friends or family. Accordingly, a negative spousal attitude towards continuation may define a reservist’s planned behavior with respect to continuation. Once defined, this planned behavior will be completed regardless of whether the individuals themselves

would prefer to continue. This Theory of Planned Behavior may therefore result in the reserve intentions that are presented below. Figure 11 outlines 2010 Reserve Survey results on family influence as self-reported by obligors.



Source: M&RA, RAP, Quantico, VA., 2010 Reserve Retention Survey Results Analysis

Figure 11. 2010 Reserve Survey Results for Family Influence Among Reservists Intending to Reenlist

As can be seen from the chart, 69.66% of respondents who reported a negative family influence stated that they would be either unlikely or very unlikely to continue and only 30.34% stated that they would be either likely or very likely to continue. In contrast, 72.17% of respondents who reported a positive family influence stated that they would either likely or very likely to continue and only 27.83% reported that they would be unlikely or very unlikely to continue. Consequently, it appears that a positive family influence has nearly an exact opposite effect on reserve continuation as compared to a negative family influence. This suggests the impacts of family support among reservists are critical in determining reserve continuation behavior.

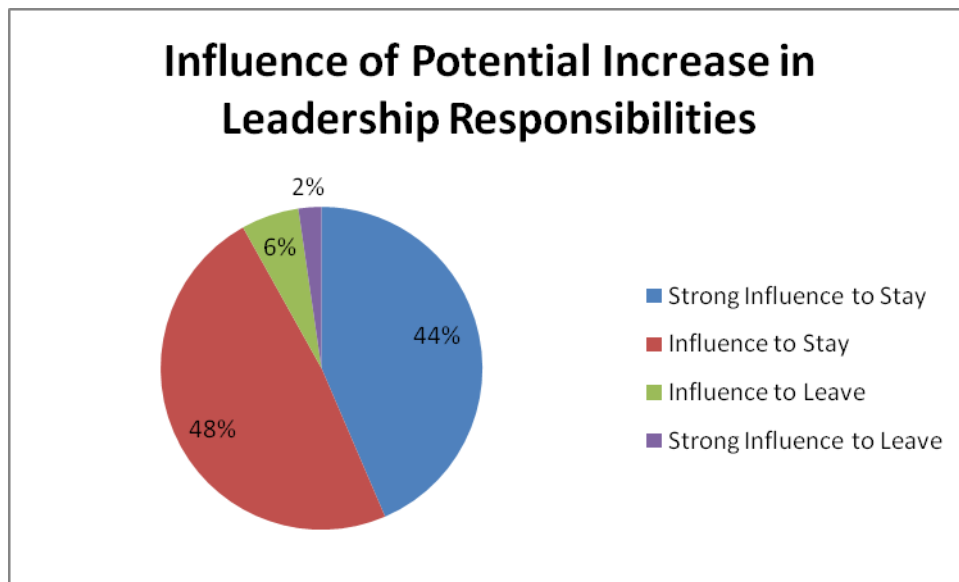
2. Unfolding Model of Voluntary Turnover

The Unfolding Model of Voluntary Turnover is a contemporary theory describing the reasons behind an individual's choice to remain or leave a job. Comprehensively the model considers factors that may attribute to a sense of "embeddedness" in a job and therefore commitment and how these are affected when a "shock" is introduced. Shocks are considered to be jarring events, which introduce the idea of leaving to the individual. For reservists, these shocks could include: deployment, increased responsibilities at primary civilian job, increased responsibilities of leadership in the reserve job, increased school conflicts, and unexpected increase in family responsibilities or concerns (Mitchell & Lee, 2001).

If individuals become reservists with the plan of balancing civilian work effectively with demands of reserve participation but later experience a sudden increase in civilian job responsibilities, they may be less likely to continue in the reserves as a result of this shock. Likewise, if an individual does not anticipate deployment upon joining the reserves they may opt to leave on a basis of the shock of deployment. Thus, the effect of deployment may be largely dependent on time period as reservists who joined in the Post-9/11 period likely expected to deploy and therefore did not receive a shock but rather experienced a fulfillment of their expectations. Met expectations play a critical role in an individual's intention to continue as they could counter-balance the negative effect of introduced shocks. In contrast, those reservists serving in the Overlap-9/11 period may have expected not to deploy and yet received the shock of deployment. Therefore this group may have had unmet expectations and also experienced a shock that may have propelled them to leave reserve service.

As noted above, increased leadership responsibilities on the reserve job may be seen as a negatively impacting shock. However, it is also possible that individuals joining Marine Reserves have an expectation of leadership in some capacity and therefore increased responsibilities in this area may lead to a fulfillment of self ideals. Aron et al. (2004) note that Self-Expansion Theory supports the notion that people have the general desire to expand themselves. Specifically, individuals attempt to, "seek and expand

themselves by acquiring resources, identities, and perspectives. That is, this is a motivation to enhance potential efficacy” (p.103). If one’s life circumstances impose rapid changes, which become more difficult to integrate easily, the result is over-expansion. Conversely, if circumstances provide insufficient opportunities to expand one’s self and meet personal expectations, under-expansion will result. Accordingly, although increased reserve service responsibility in leadership may result in over-expansion for some, there is also a strong possibility that an increased leadership role prevents under-expansion of self. The 2010 Reserve Retention Survey analyzed the results of an increased leadership role as self-reported by obligors. Figure 12 graphically depicts reservists’ responses concerning the influence increased leadership responsibilities would have on their intention to continue.



Source: M&RA, RAP, Quantico, VA., 2010 Reserve Retention Survey Results Analysis

Figure 12. 2010 Reserve Survey Results for Increased Leadership Responsibilities on Continuation Intention

As shown, approximately 92% of Marine reservists reported that an increased responsibility to lead and train Marines was a positive influence or a strong positive influence on their intention to continue in the reserves. Thus, it appears that increased leadership responsibilities are not a detrimental shock to Marine reservists but rather a fulfillment in met expectations.

C. PERSONAL FACTORS

1. Human Motivation Theory

Weiss et al. (2002) support that substantial previous literature indicate certain organizations provide a context for “achievement motivation” and “performance”. Individuals, who enjoy being both challenged and placed in situations to overcome difficult tasks, may flourish in work settings that can provide this environment. Intrinsically speaking, those serving in the Marine Corps as reservists may possess similar attributes and have self-selected into an environment where “performing well” is the normal expectation.

A highly recognized motivational theory that closely aligns with motivation behavior in the reserves is McClelland’s Learned Needs Theory. McClelland contends that individuals have learned and acquired certain needs from the culture of society in their earlier stages of life. Specifically, McClelland posits the following four needs exist within all individuals and influences the manner in which they are motivated: (1) Need for Achievement, (2) Need for Power, (3) Need for Affiliation, (4) Need for Autonomy.

First, the need for achievement aligns well with Marine Corps Reserve participation. McClelland characterized the need for achievement as, “behavior towards competition with a standard of excellence” (Steers et al., 1996, p. 18). Those individuals who fall into this category have higher tendencies towards achieving goals, taking calculated risks, and are more preoccupied with task accomplishment. Reservists volunteer to serve their country above and beyond natural demands of civilian living, as well as serving in arguably the most challenging branch within the military. Thus, reservists serving in the Marine Corps may perhaps be systematically different from

reservists serving in other branches. Results from the 2010 Marine Corps Retention Survey found that most Marines desire a greater level of leadership responsibility as indicated in Figure 12, and therefore increasing leadership opportunities may help increase retention.

Next, the need for power tends to represent those who are superior performers and have above average records. The total percentage of NPS reservist who entered into service with high quality AFQT scores (Category 1-3A) were 78% within the population of this analysis. Furthermore, fundamental practices in military statistical studies most often involve using variables that are representative to an individual's performance and ability. This supports the theoretical tenets within McClelland's Learned Needs Model.

The need for affiliation was defined as individuals who have a strong desire for approval and reassurance and individuals with tendencies to conform to the wishes and needs of others when pressured by valued friendships (Steers et al., 1996). This can be legitimized through the Marine Corps Warfighting Publication (MCWP 6-11, 2002, p.15), where it is cited,

They were closer to me than I could say, closer than any friends had been or ever would be...Men, I now knew, do not fight for flag or country, for the Marine Corps or glory, or any other abstraction. They fight for one another. Any man in combat who lacks comrades who will die for him, or for whom he is willing to die, is not a man at all. He is truly damned."

Marine Corps history culturally embodies a strong ethos and esprit de corps, which arguably attracts those who embrace it. The extraordinary cohesion between Marines is said to be more than a function of a particular unit within the Corps, but rather a function of the Corps itself (p.15).

Lastly, the need for autonomy is defined by McClelland as those who need a sense of individuality. This appears to exist more within the civilian community, yet brings up an interesting point. Since reservists work within the spectrum of both civilian and military realms, they may possess stronger characteristics of both autonomy and affiliation and therefore place a greater value in both characteristics, suggesting that incentives for reservists may be different than those in the active component. Since

reservists do not commit to active duty service, there is clearly some aspect of autonomy in civilian life that is critical to their identity as a person. However, participation in the reserves, particularly the Marine Corps, demonstrates an attachment of group affiliation. Weiss et al. (2002) note, “One’s identity as a group member may be central to the self, therefore increasing attachment to that group because one would experience a significant loss of the self should he or she leave that organization” (p.23). This complex group affiliation versus individualism balance justifies the need for manpower analysts to step outside the “quantitative magnifying glass” and analyze reserve behavior more through the fundamental building blocks of human motivational models.

D. SUMMARY

The social and psychological insights outlined in this chapter present an interesting supplement to standard economic theoretical perspectives commonly used in econometric analyses. Notably, the structural, environmental, and personal factors discussed here provide an enriched perspective on reserve continuation rates. Certain factors were seen to have a mutually positive effect on continuation; for instance, increased leadership responsibilities could help fulfill personal expectations. However, some factors compete against one another. For example, while increased leadership responsibilities may have a positive effect on continuation, the resultant increased work load may have a negative effect. Environmentally, family and spousal attitudes were also significant contributors to reservists’ intentions to continue, and may have competed against the positive influence of a personal need for affiliation.

In conclusion, while consideration of these social and psychological factors was not intended to provide an all-encompassing view of reserve continuation behavior, it is relevant to this thesis. These factors contribute to the over-arching themes of job satisfaction and organizational commitment and therefore ultimately impact the decision to stay or quit military service. Thus, it is important to review these factors as a framework for the statistical analysis.

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V. DATA AND METHODOLOGY

This chapter will discuss each data source, methodology, and the limitations of this study. Section A will discuss the data sources, Section B will describe the scope and methodology, and Section C will discuss the data limitations.

A. DATA SOURCES

1. Reserve Affairs Personnel Plans and Policy (RAP)

All data supplied for this study was provided by RAP, which worked in conjunction with DMDC and CNA to obtain additional data required. All data elements containing any personal identifiable information were sanitized prior to obtainment. RAP utilized the Marine Corps Total Force Data Warehouse (TFDW) in order to acquire most of the data.

a. Defense Manpower Data Center (DMDC)

Data containing information for the Montgomery G.I. Bill and data with monetary incentives, which included enlistment and reenlistment bonuses, were obtained by RAP. However, manpower policy prior to fiscal year (FY) 2011 did not extend eligibility for reenlistment or affiliation bonuses to non-prior service personnel below the rank of sergeant, and only then, after the waterfall transition point. Thus, monetary incentives were not relevant to the subject population and only the Montgomery G.I. Bill data was usable.

b. Center for Naval Analysis (CNA)

Monthly seasonally adjusted state unemployment data were obtained for the entire range of the data set from December 1994 to September 2010. This unemployment data originated from the U.S. Bureau of Labor and Statistics.

*c. Total Force Data Warehouse (TFDW)*²¹

The TFDW records its data elements from the Marine Corps Total Force System (MCTFS) at the end of every month. These MCTFS data elements gather all administrative pay and personnel information for all Marines serving in both the active and reserve components, and stores end-of-month observations of certain data elements into TFDW. The resulting uploads, called sequences, contain a monthly snapshot of the Total Force. Appendix A outlines the specific dates of each sequence snapshot and ranged from—December 31, 1994 to September 30, 2010 (sequences 92-259). However, only quarterly observations prior to FY 1999 were consistent and available. Thus, for this thesis, 168 sequence dates and 79 data fields were pulled from TDFW amounting to 4,696,141 monthly-person observations. However, econometric analysis will be limited to quarterly observations for Fiscal Year 1998 due to the above mentioned data limitations. Specific sequence dates of this study will encompass the following²²:

- Unrestricted Full Sample (covering all time periods)
 - Sequence dates: 106 to 247
- Restricted Pre-9/11 Sample
 - Sequence dates: 106 to 151
- Restricted Overlap-9/11 Sample
 - Sequence dates 152 to 223
- Restricted Post-9/11 Sample
 - Sequence dates 224 to 247

²¹ The Total Force Data Warehouse (TFDW) is a restricted system of the Manpower Information Technology Branch of Manpower and Reserve Affairs (M&RA). It is the Marine Corps' official system of record for USC Title 10 end strength reporting. TFDW houses more than 30 years of historical manpower data from a variety of USMC and Department of Defense systems, to include MCTFS, MASS, RCCPDS, MCTIMS, and DEERS (Price, 2010).

²² For each time period, limited use of sequences 12 months beyond these sequence dates will be used to determine continuation. For instance, sequence 259 will be used to determine 12-month continuation rates for sequence 247.

2. Coding

The MCTFS Codes Manual was utilized to interpret and code each TFDW data element. All data elements were merged and compiled in such a manner for Headquarters Marine Corps to utilize the compiled data for continual and future analysis beyond the scope of this thesis.

B. METHODOLOGY

The focal point of this thesis is the “*waterfall period*,”²³ which has been identified as the top priority by Marine Corps manpower planners. Determining the possible correlations of this drastic decline in reserve continuation with many different factors will be elucidated using this research approach. Figure 13 serves as a graphical representation that shows this methodology in detail.

²³ The “waterfall period” has been awarded its name from USMC Reserve Manpower Planners as a means of describing the drastic drop in reserve continuation that takes place upon the completion of NPS reservists drilling obligation period. When graphically depicted, the immense loss takes on the shape of a waterfall and results in 81% of the NPS reservists’ non-continuation.

Multivariate Approach to Analyzing NPS Behavior

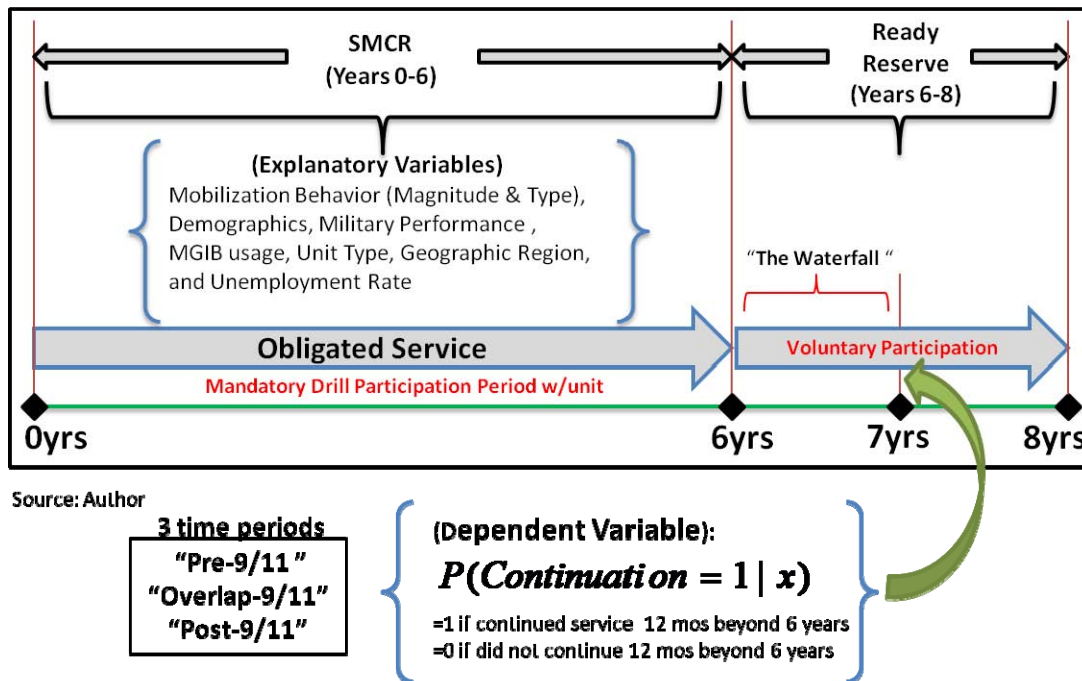
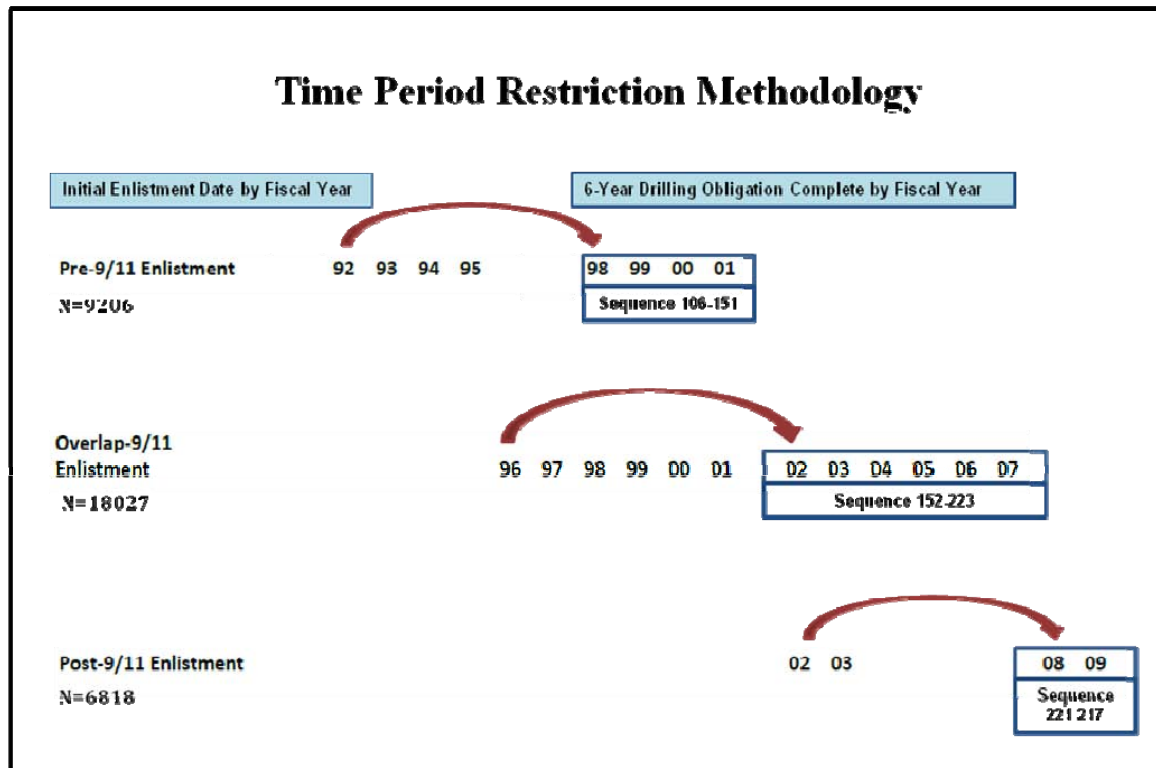


Figure 13. Multivariate Methodology for NPS Continuation Behavior

As depicted, a binary response multivariate model will be used in obtaining the NPS probability of continuation by determining if the person exists in the data 12-months beyond their completed 6-year drilling obligation.

In addition, this study will further analyze and test for potential systematic differences among three identified time periods and how they may influence the effects of continuation behavior. In order to test for these hypothesized systematic differences across time periods of NPS reserve utilization, Figure 14 depicts how the data sample will be isolated with respect to the Pre-9/11, Overlap-9/11, and Post-9/11 time periods. Of special note, it is important to underscore that the Post-9/11 period (shown in Figure 14) only encompasses mainly those who joined the MCR just after September 9/11 until just after the commencement of OIF; thus, necessitating the need for future study.



Source: Author

Figure 14. Time Period Restriction Methodology

Additionally, this research will identify other statistically significant predictors with respect to continuation behavior such as mobilization, unemployment rate, unit type, occupational field, geographic region of reserve service, Montgomery G.I. Bill usage, rank, education, marital status, gender, and age.

C. DATA LIMITATIONS

The goal of this thesis is to estimate certain effects on NPS 12-month continuation rates for those reservists who have completed 6-year drilling obligations. Although the model does capture valid statistical data, which can be used to calculate continuation rates, there are several data limitations to keep in mind.

A primary limitation of this research involves data availability for the Post-9/11 time period. Since the model assesses whether a person exists in the dataset 12-months beyond the end of their initial drilling obligation period, the data simply cannot evaluate

NPS personnel who began their enlistment periods after FY 2003. The data can only capture records up to September 2010 (sequence 259) and therefore is limited in scope for the Post-9/11 model.

Also, the model does not take into account those who have been lost to attrition prior to completing their 6-year drilling obligation. Rather, the data is used to assess those who successfully reached the completion of their 6-year contracts, and of those that did, which of them ultimately chose to stay in SMCR units. Currently, manpower planners have identified the continuation rate problem to be of first priority; a close second will be aimed at examining specific attrition related problems within the NPS population. Of note, the annual attrition rate for the Marine Corp's NPS population is approximately 9%, adding up to just under 50% over six years and will assume top priority for future studies (Price, 2011).

The restricted samples mentioned above (Pre-9/11, Overlap-9/11, and Post-9/11) do not contain identical sample sizes within each category. This is a result of both the combination of research design and time specific limitations. For example, in order to facilitate an equal sample size for the Post-9/11 time period, this analysis would need to wait five more years to allow for those who enlisted during the years of 2004 – 2007 to reach 1-year beyond the completion of their 6-year contracts during the years of 2011 - 2014 in order to test for their decision to continue. This limitation is graphically apparent in Figure 9 above. As seen in Figure 9, the Full Sample Model (covering all periods), and the Overlap-9/11 Model provide the most observations, N=34,051 and N=18,027 respectively. Whereas, the Post-9/11 can only account for 2-years of continuation rates with decision points occurring at 2008 and 2009 with N=6818. However, these numbers can still provide important insight into Post-9/11 continuation behavior.

Valid monetary reenlistment bonus data was initially obtained from DMDC to isolate for those possible incentive effects on continuation. However, Pre-FY11 Marine Corps policies that limited reenlistment bonuses to the ranks of NPS Sergeants and above after completing their 6-year drilling obligation prevented their use in this study. On the other hand, Montgomery G.I. Bill usage data was obtained and was controlled for in the statistical models.

Lastly, deployment data and variables are problematic in two ways. First, since prior to 9/11, the NPS population had virtually no mobilizations/deployments. To be exact, a total of 24-NPS-Marines were mobilized in support of a contingency operation prior to 9/11, therefore, due to this small number; regression analysis is unsubstantial as it pertains to mobilization and lacks relevance. However, this supports the previously outlined hypothetical premise that Marines prior to 9/11 may have not expected to deploy, and never did deploy, and therefore we can test for continuation effects not relative to mobilization. Second, in order to test for occurrence, type, and frequency of mobilization, the variables themselves contain some correlation (although small) with each other. For example, those that were mobilized twice (*mob_2*), may overlap with the variable measuring the deployment frequency of being mobilized 7–12 months (*mob_bin2*) and vice versa. This will be overcome through various model specifications, which can help alleviate this limitation.

D. SUMMARY

The intent of this chapter was to provide source and background information on the data used in this study, provide depth in understanding the research scope and methodology and acknowledge relevant issues and concerns that have been considered when developing these statistical models. The next chapter will discuss the specific variables used in the quantitative analysis.

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VI. VARIABLE DESCRIPTION

This chapter provides both an overview and description of the dependent and independent variables as identified in Table 3, and then presents the descriptive statistics and preliminary analysis. Section A provides an overview of each variable, Section B discusses the dependant variable description, Section C describes the independent variables, Section E outlines the descriptive statistics, and Section F discusses the preliminary findings of this research.

A. VARIABLE OVERVIEW

The variables outlined in this chapter represent the final merged and coded data set used for the multivariate models. Table 3 shows the overview of each variable.

Table 3. Overview of Each Variable

Category	Variable Description	Variable Name	Variable Type	Range
DEPENDENT				
	Retained 12 Months Beyond 6-Year Drilling Obligation	ret_12mos	Binary	1=Retained 0=otherwise
INDEPENDENT				
Deployment	Previously Deployed Overseas	oconus_deployed	Binary	1=Retained 0=otherwise
	Mobilized 1-6 Months	mob_bin1	Binary	1=Mobilized 0=otherwise
	Mobilized 7-12 Months	mob_bin2	Binary	1=Mobilized 0=otherwise
	Mobilized Twice	mob2	Binary	1=Mobilized 0=otherwise
Demographics	Gender	male	Binary	1=Male 0=otherwise
		female	Binary	1=Female 0=otherwise

Category	Variable Description	Variable Name	Variable Type	Range
	Race	white	Binary	1=White 0=otherwise
		black	Binary	1=Black 0=otherwise
		asian	Binary	1=Asian 0=otherwise
		other	Binary	1=Other Race 0=otherwise
	Marital Status	single	Binary	1=Never Married 0=otherwise
		married	Binary	1=Married 0=otherwise
		divorced	Binary	1=Divorced 0=otherwise
	Dependants	no_child_1plus	Binary	1=At Least Child 0=otherwise
	Age	age	Continuous	Min=20.85 Max=41.14
Military Performance Variables	AFQT	afqt_low_quality	Binary	1=If AFQT CAT 3B or 4 0=otherwise
		afqt_high_quality	Binary	1=If AFQT CAT 1 - 3A 0=otherwise
	1st Class PFT Score	pft1	Binary	1=1st Class Score 0=otherwise
	2nd Class PFT Score	pft2	Binary	1=2nd Class Score 0=otherwise
	3rd Class PFT Score	pft3	Binary	1=3rd Class Score 0=otherwise
	PFT Failure	pft_fail	Binary	1=PFT Failure 0=otherwise
	PFT Medically Exempt	pft_med	Binary	1=PFT Exempt/Medical 0=otherwise
	Currently Deployed (PFT Exempt)	pft_deploy	Binary	1=PFT Exempt/deployed 0=otherwise
	Proficiency/Conduct Score	pro_con	Continuous	Average Proficiency/Conduct Marks in Service (converted)
Education	Alternate High School Credential	hs_alt	Binary	1=Alt High School 0=otherwise

Category	Variable Description	Variable Name	Variable Type	Range
	High School Diploma	hs_dg	Binary	1=High School Diploma 0=otherwise
	Any College Degree	college_degree	Binary	1=Any College Degree 0=otherwise
Rank	Private	pvt	Binary	1=if Private 0=otherwise
	Private First Class	pfc	Binary	1=if PFC 0=otherwise
	Lance Corporal	lcpl	Binary	1=if Lance Corporal 0=otherwise
	Corporal	cpl	Binary	1=if Corporal 0=otherwise
	Sergeant	sgt	Binary	1=if Sergeant 0=otherwise
MGIB Usage	MGIB Previously Used During Enlistment	mgib_prior	Binary	1=if MGIB previously used 0=otherwise
	MGIB Currently in Use	mgib_current	Binary	1=if MGIB in current use 0=otherwise
Unit Type	Marine Division	div	Binary	1=if div unit 0=otherwise
	Marine Logistics Group	mlg	Binary	1=if mlg 0=otherwise
	Marine Air Wing	maw	Binary	1=if maw 0=otherwise
Geographic Regions (by Census Region)	Midwest East IL, IN, MI, WI, OH	midwest_e	Binary	1=if Regional State 0=otherwise
	Midwest West MO, ND, NE, KS, SD, MN, IA	midwest_w	Binary	1=if Regional State 0=otherwise
	New England CT, MA, ME, NH, RI, VT	new_eng	Binary	1=if Regional State 0=otherwise
	Mid Atlantic NJ, NY, PA	mid_atl	Binary	1=if Regional State 0=otherwise
	South Atlantic FL, GA, SC, NC, VA, WV, DC, MD, DE	south_atl	Binary	1=if Regional State 0=otherwise

Category	Variable Description	Variable Name	Variable Type	Range
	South East KY, TN, MS, AL	south_east	Binary	1=if Regional State 0=otherwise
	South East Central OK, AR, TX, LA	south_east_c	Binary	1=if Regional State 0=otherwise
	West Mountain AZ, NM, NV, UT, ID, CO, MT, WY	west_mtn	Binary	1=if Regional State 0=otherwise
	West Pacific CA, HI, OR, WA, AK	west_pac	Binary	1=if Regional State 0=otherwise
Unemployment Rate	State Unemployment (Seasonally Adjusted)	unemp_rate	Continuous	min:2.1 max:15.4

B. DEPENDENT VARIABLE

1. 12-Month Continuation

The interest in obtaining 12-month continuation probabilities is derived from a variety of reasons. First, Marine Corps manpower planners fundamentally base their staffing management models on a fiscal year basis and can better apply 12-month continuation results to their existing tools. Second, as previously mentioned in the introduction and literature review, NPS reserve behavior poses unique and difficult challenges as it pertains to attrition and retention. Therefore, for the purpose of this study, the dichotomous dependent variable *ret_12mos* (12-month continuation) will examine whether a reservist is still serving in the reserves 12 months beyond their 6-year drilling commitment. As Table 3 shows, for those that stay, the variable = 1 and those that do not if = 0.

C. EXPLANATORY VARIABLES

1. Mobilization

The unique relationship between deployment and mobilization presents challenges to reserve studies that investigate deployment effects. However, this study is

easier to control for these differences between deployment and mobilization since Marine Corps NPS reservists primarily are involuntarily “mobilized as units” and are most often deployed in support of contingency operations. This is in contrast to many other reserve branches that have high mobilization rates that do not involve serving overseas.

Mobilization can elicit important information pertaining to reserve retention behavior. As previous reserve studies suggest, mobilization frequency and type are important to consider, especially since mobilization may affect reservists differently given the increased burden on their primary civilian employment. Loss rates among reservists have been linked to the specific characteristic of being mobilized for any period of time, or not being mobilized at all (Dolfini-Reed et al, 2005). Therefore, this thesis measures mobilization frequency and type by using four mobilization variables: (1) previously deployed overseas; (2) mobilized 1–6 months; (3) mobilized 7–12 months; and (4) mobilized twice. This analysis intends to utilize these variables to isolate and further assess specific time periods as they may relate to reservists’ expectations of mobilization and deployment.

a. Previously Deployed Overseas

This dichotomous variable indicates whether a person has previously deployed overseas in any capacity. If an individual was mobilized and deployed overseas at any time during their enlistment, then this variable takes on a value of 1, and 0 if otherwise. This variable is not intended to test for specific location effects, but rather the actual experience of ever deploying overseas. To deploy overseas, regardless of location, presents numerous life challenges to family, civilian employment and various other life interruptions. From the overall dataset, 44% of NPS reservists have deployed overseas at least once, with this number varying among the different periods of Pre-9/11, Overlap-9/11, and Post-9/11.

b. Mobilized (1–6 Months)

This variable indicates whether an individual has mobilized 1–6 months and takes on a value of 1 if a person has been mobilized for a period of 1–6 months, and a

value of 0 if otherwise. Drawn from the historical activation dates within the data, this variable represents the category of shorter mobilization lengths based on doctrinal deployment trends and patterns, which have existed specific to NPS reservists. Previous research indicates that lengthy mobilization periods negatively affect retention in most cases, so it is valid to examine further how specific mobilization lengths influence continuation behavior (Dolfini-Reed & Bowling, 2010).

c. Mobilized (7–12 Months)

Similar to the variable mobilized 1–6 months, this variable takes on a value of 1 if a person has mobilized more than 6 months during their enlistment, and 0 if otherwise. Those that have mobilized more than 6 months in this dataset comprise 43% of the population and represent the typical mobilization lengths currently occurring in SMCR units. Interestingly, this frequency almost doubles in the Post- 9/11 period and will be discussed further in the preliminary results portion of this chapter. Since the percentage of NPS personnel mobilized for more than 12 months is negligible, this variable will be referred to as mobilized 7–12 months in this thesis.

d. Mobilized Twice

As previously mentioned, multiple mobilization frequencies are an important characteristic to consider when analyzing mobilizations amongst certain reserve types. However, for NPS reservists, the Marine Corps is specifically interested in examining if a person has mobilized twice or more since the likelihood of NPS reservists mobilizing more than once in a 6-year period is not typical given the force generation model and a desired mobilized: dwell ratio of 1:5 (Price, 2011).

2. Demographic Variables

Naturally, demographic characteristics are of vital importance when analyzing military manpower related topics. Within the scope of this thesis, gender, race, marital status, the number of dependants, and age will all be included in this regression analyses below.

a. *Gender*

One dichotomous gender variable was created for female, which = 1 if a person is female, and = 0 if male. Overall, the data indicates 97% of the NPS population is male. Gender characteristics are extremely relevant and important to closely analyze as they may also be more affected by women's decisions to bear children during increased mobilization expectations, especially during the Post-9/11 period.

b. *Race/Ethnicity*

Race/Ethnicity has been classified into four categories, White, Black, Asian, and Other. The TFDW raw data did provide for the additional race categories of Pacific Islander and Native American races. However, these comprised less than 1% of the population and were placed in the "other" race category. Of additional note, 13% of reservists did not provide race/ethnic information. The non-responders were combined with the "other" race category. Lastly, the TFDW data did not indicate Hispanic ethnicity, which was most likely absorbed in the white and other race categories. Price (2010) points out that, historically, minority races have been drawn to military service due to their individual perceptions regarding equal opportunity treatment; however, their tastes for service during intense mobilization may not be significantly linked to actual racial differences.

c. *Marital Status*

Marital status is grouped into three main categories: single, married, or divorced. Two separate variables were created to define these categories, *single* and *divorced*. The single marital status category for this dataset represents 68% of the total sample, while 30% are married, and 2% are divorced. This distribution is largely affected by their average age, which is 25.8 years old at the continuation decision point. Most NPS reservists begin service as single, while approximately one-third will marry by the latter portions of their 6-year SMCR drilling obligation, as indicated in this dataset.

Marital status for reservists is interesting and relevant for retention analysis. As Price (2010) indicated, there are unique family dependency dynamics specific to reserve participation that differs from the active component. Reserve spouses may be more likely to pursue and maintain higher paying jobs without having to relocate as frequently, if at all, compared to spouses of active component personnel. Therefore, the additional income of reserve participation may be less attractive to married reservists.

d. Dependants

Since 91% of NPS Marines in the overall dataset did not have children, while 6% had one child, 2% had two children, and less than 1% had over three children, a dichotomous variable was created for which = 1 if the number of children is 1 or greater, and = 0 otherwise. Given the young age in the population of NPS reservists, determining effects of having 1 or more children is more conducive for this statistical analysis.

Previous reserve studies, like Price (2010) and others have determined that the effect of children on reserve continuation is ambiguous at best and needs further analysis, especially since the increased demand for reservists to mobilize may pose unique challenges for those reservists with children, and more so, for those who are single parents. On the other hand, married individuals with children may have greater need for additional income or enjoy the respite reserve service provides.

e. Age

The variable age is a continuous variable based on the date of observation. The average age for the raw NPS population data is 22.84 and 25.79 for those that have completed their 6-year drilling contracts. Previous empirical reserve focused research has identified that age may negatively influence reservists' propensity to stay as they begin to mature and take on competing social and civilian employment demands. For example, most reservists develop competing career interests that make it difficult to continue serving in the reserves when they reach the end of their contracts (Dolfini-Reed & Bowling, 2010).

3. Military Performance Variables

This category of variables will be used to describe the performance and ability related measures that may serve as proxies for a person's military adaptability, motivation, and person-job fit within the organization, which may influence their continuation of service beyond their contract completion. The Marine Corps maintains its own unique military culture and job performance standards, which may affect how reservists' perceive their suitability to continue to serve based on their performance in the these areas.

a. AFQT

Armed Forces Qualification Test (AFQT) scores were grouped into two main categories: low quality AFQT score and high quality AFQT score. Anyone falling into the AFQT categories of 1-3A was classified as "high quality scores," whereas AFQT scores in categories 3B and below were classified as "low quality scores." Both variables are binary. The primary justification for this approach was due to problematic categorical representation amongst the data.

Previous research on the topic has found that the AFQT test scores among Marine Corps reservists have increased nearly 5% from 64.2 to 67.4 from Sept 2001 to Sept 2006 (Dolfini-Reed & McHugh, 2007). This evidence is further supported by this NPS dataset where the population's initial entry scores between 1997–2009 had an average AFQT score of 66 (category 2 or high quality score). Further, high quality scores comprised 82.24% of scores in this full sample. AFQT test scores appear highly relevant to use as predictor variables in this study since they may potentially signal an increase in civilian job opportunities and earning potential for those that have high quality scores, and thus impacting continuation rates (Price, 2010). Potentially, individuals with higher AFQT scores are more likely to experience a large income loss during mobilization, which could serve as a deterrent to continued service in the SMCR.

b. PFT Score

The Marine Corps Physical Fitness Score (PFT²⁴) is strongly correlated with the indispensable aspect of leadership. Culturally, many Marines who perform well on the PFT are perceived to be good overall performers within the Corps and possess the prerequisite characteristics of determination, discipline, and motivation in order to maintain strict physical fitness standards. Certain performance levels on the PFT may help identify and indicate certain systematic differences of those who score well on the test and those who do not. The PFT variables are binary and divided into 5 categories: first class PFT, second class PFT, third class PFT, medically excused from PFT, PFT failure, and PFT deployed. The PFT Medical variable accounts for those scores in the data that represented individuals excused or injured preventing a Marine from taking the PFT. Lastly, the PFT deployed variable accounts for those who are exempt from taking the PFT due to being in a deployed status. The Marine Corps PFT scoring distribution²⁵ is outlined in Table 4.

Table 4. Marine Corps Physical Fitness Test Standards

Marine Corps Physical Test Standards			
Class	Age 17-26	Age 27-39	Age 40-45
1st Class	225 - 300	200 - 300	175 - 300
2nd Class	175 - 224	150-199	125 - 174
3rd Class	135-174	110-149	88 -124

Source: Marine Corps Order (MCO) P6100.12

²⁴ The Marine Corps Physical Fitness Test (PFT) consists of a timed 3-mile run, crunches performed in a two-minute time limit, and the performing of dead-hang pull-ups on a stationary bar. The maximum score in each category when totaled will equal 300: an 18:00 minute 3-mile run, 20 pull-ups, and 100 crunches.

²⁵ Note: the PFT Score Table above excluded the age category of 46 and above, since that specific age group is not relevant to this study. Most ages represented in the dataset are between 17-26 years.

c. Proficiency and Conduct Score

For Marines below the rank of Sergeant, another indicator of job performance is their Proficiency (Pro) and Conduct (Con) Markings. This score attempts to encompass numerous aspects of their military performance, ability, and character and conceivably may offer the most comprehensive measure of the *overall military ability* of an individual. Per the Marine Corps Individual Records Administration Manual (IRAM)²⁶ the assignment of proficiency marks takes into consideration the following individual traits: technical skills, specialized knowledge, leadership, and overall Marine skills such as battle skills testing (BST) results and professional military education.

The assignment of conduct marks takes into account the following traits: military bearing, attitude/enthusiasm, reliability, positive influence on others, courtesy, adaptability, obedience, participation/cooperation, integrity, interest, and community activity. Acquiring high rated marks may signal a propensity to continue military service; however, it may also be a cue for susceptibility to leaving reserve service since their requisite skills sets may be in high demand in the civilian sector.

Each variable (proficiency and conduct) is graded on a 5-point scale, and averages the total combined pro/con marks received during their entire enlistment period. Since they both are comprehensively examining military related traits, the two variables have been combined together on a 10-point scale, which provides an aggregate overall pro/con rating²⁷. There is some internal bias built into each pro/con rating because, as with any rating system, potential for subjectivity bias is always present.

²⁶ The Individual Records Administration Manual (IRAM), Marine Corps Order (MCO) P1070.12K, issues guidance and compliance for all administration records, to include specific marking guidance to leaders as they pertain to proficiency and conduct markings for Corporals and below. Marines with average pro/con marks below 4.0 are not eligible for promotion and average marks for a Marine typically are around 4.4 in both categories.

²⁷ The 10.0 combined score was created by subtracting 4.0 from each score (i.e., those not reenlistment eligible) and then multiplying by 5. Thus, a change from 4.4 to 4.5 in average proficiency scores would result in an increase of 1 point, while an increase in both proficiency and conduct scores from 4.4 to 4.5 would result in an increase of 2 points on a 10-point scale.

d. Rank

There are five binary rank variables for Private (Pvt), Private First Class (PFC), Lance Corporal (LCpl), Corporal (Cpl), and Sergeant (Sgt). Ranks are inherently a function of performance and ability and those that are promoted to the rank of Cpl and Sgt may have a stronger propensity to continue service. Further, it is important to note that the primary focus of rank effects will center around the ranks of Cpl and Sgt, since those Marines make up the preponderance of the population that manage to complete their 6-year drilling obligations. In addition, Lance Corporals will most likely be ineligible for reenlistment when they reach 8 years of service due to service limitations that require achieving a minimum rank of Sergeant, which is difficult to achieve in only 2 years. Thus, Marines that continue beyond 6 years of service in the rank of Lance Corporal must be motivated by something other than long-term career aspirations.

4. Education Benefits

a. Montgomery G.I. Bill Usage (MGIB)

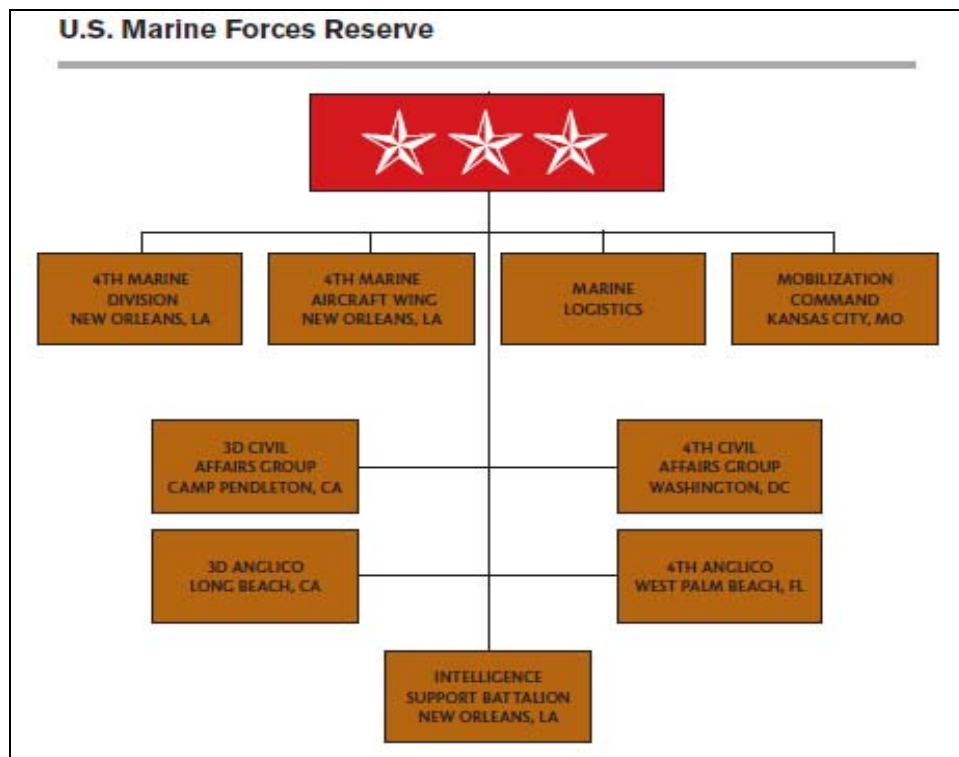
An important benefit that has been analyzed in previous military research is the Montgomery G.I. Bill. The G.I. Bill has been used as a principal sales tactic to entice military-age civilians to join the military. There were two binary variables used to consider education incentive effects in this analysis. The first binary variable *mgib_prior* determines if there has been any previous use of MGIB benefits during their enlistment, even if the benefits were stopped at any point in time. The second variable, *mgib_current* indicates if the person is in current receipt of any MGIB payments.

The primary rationale behind testing prior MGIB usage is perhaps a person who previously used the benefits several years ago may have a lesser propensity to continue service than someone who is currently using MGIB benefits or has never used them. Further, this variable may have a stronger effect during certain time periods, such as the Pre- and Post-9/11 periods, where expectations were the most clear about mobilizing, and reservists enlisted to utilize these educational benefits. These effects

may help explain their relationship with continuation rates, and whether their service in the Marine Corps Reserve was educationally motivated.

5. Unit Type

All SMCR Marines can be doctrinally grouped into four main organizational categories as Figure 10 depicts: 4th Marine Division (DIV), 4th Marine Air Wing (MAW), Marine Logistics Group (MLG), and Mobilization Command.



Source: USMC Concepts & Programs Manual, 2010

Figure 15. Marine Forces Reserve Unit Types

Since this thesis is only interested in analyzing NPS reservists, the unit types that are relevant are the DIV, MAW, and MLG, since Mobilization Command is not normally sourced with a significant number of NPS reservists. The Mobilization Command contains less than 1% of the total NPS population and therefore was excluded for that

reason. In addition, force units such as Anglico, Intelligence Support Battalion, and Civil Affairs Group contained less than 3% of the total NPS population and were similarly excluded from this analysis.

To further isolate continuation effects, it is appropriate to control for systematic differences, which may occur among these three unit types. For example, a Marine Division Unit, which predominately accounts for ground combat arms elements, possesses unique variations in culture, training, and work climate as compared to the Marine Air Wing and Marine Logistics Group, which consist of all combat service support functions. Interpersonal relationships, unit cohesion, and leadership all vary across these unit types. Therefore, to examine reserve participation behavior without considering the organizational differences among unit types would be simply one-dimensional. Reserve aviation units typically have more funding and are culturally known to have a higher quality of life due to their proximity to large bases and airfields (Price, 2010). Additionally, some occupational fields that primarily serve within air wing units are in highly specialized fields that may or may not be in demand in their local civilian communities and can potentially affect continuation behavior as well. Moreover, instead of choosing to serve in the reserves based on certain occupational interests, many reservists may self select and choose reserve service based on “geographical convenience” to units that are within close proximity to their homes. This can be problematic and can mask continuation effects because the reservists’ entry decisions were based more on geographic convenience alone, and not on a good person-job fit.

6. Geographic Locations

As Dolfini-Reed and McHugh (2007) indicate, the geographic distribution of reservists has not shifted since the September 2001–September 2006 period. Therefore, 9 dichotomous geographic variables have been created to use with the Census Bureau’s 9 geographic divisions. Figure 16 further explains the specific geographic assignments.



Source: Census Bureau's Geographic Areas Reference Manual, 2005

Figure 16. Census Regions and Divisions of the United States.

Table 3 described the specific variable name and state distribution of the nine geographic regions. Although numerous important characteristics can be examined for the nine regions, which extend beyond the scope of this analysis, their main use in the models is to isolate potential propensity within certain geographic areas of the country. For example, patriotism and community support for the military service varies across areas of the United States.

7. Unemployment Rate

The variable for the seasonally adjusted state unemployment rate is a continuous variable based on an individual's home state and drilling residence during the monthly sequence observation. Based on the Annual Cost of Living (ACOL) Model, a rise in unemployment may affect a person's decision to remain in service for pecuniary benefits (Price, 2010).

D. SUMMARY

This chapter has provided an overview of the variables, along with a discussion of the utility of each variable used in this analysis. The independent variable has been described as a dichotomous variable indicating a 1 if the reservist has completed his/her 6-year drilling contract and continued to participate 12 months beyond that completion date, and 0 otherwise. The specific dependent variables included in this study are: mobilization variables, race, gender, marital status, dependant status, education, military performance variables, unit type, geographic region, and unemployment rate variables. These variables provide the framework for the next chapter, which provides descriptive statistics and preliminary data analysis.

VII. DESCRIPTIVE STATISTICS AND PRELIMINARY DATA ANALYSIS

The purpose of this chapter is to present the descriptive and summary statistics. As previously discussed, when examining this entire period from Fiscal Year 1998–2009, it will be important to restrict the specific periods that occurred within this turbulent span of time. Since September 11, 2001, and the onset of Iraq and Afghanistan conflicts, reserve utilization and mobilizations have potentially affected continuation rates. The following series of tables provide descriptive data for the four main periods covered by the data: the full sample and the Pre-9/11, Overlap-9/11, and Post-9/11 time period restrictions.

A. FULL SAMPLE DESCRIPTIVE STATISTICS

Table 5 provides descriptive statistics for the full sample. There are three main categories provided: the percent distribution of sample (column 1), the continuation percentage by category (column 2), and the percent distribution of the continuation group (column 3). As previously discussed, this thesis is focused on the “*waterfall period*,” therefore, the percent distribution in column 1 is based on those NPS Marines who have completed their 6-year drilling obligations and are currently at their decision point to continue service. Column 1 represents the percent make-up of those who completed their contracts. The continuation in column 2 is the break down by category of the percentage of NPS Marines who continued. Finally, column 3 is the percent make-up of NPS Marines who have continued participating in SMCR units 12 months beyond their contract completion. For instance, out of the total sample of NPS Marines that continued, the percentage distribution can be described as 97.20% male and 2.80% female (column 3) as compared to 97.09% male and 2.91% female with originally completed contracts (column 1). As expected, these percent make-ups are similar, relative to the number of completed contracts verses the number who continued, because the continuation group is a subsample and therefore maintains the general characteristics and is representative of

those who completed their contracts. Those categories with differences in percentage make-up will be analyzed further to determine whether the given categorical characteristics affect continuation rates.

It should be noted that there existed some missing observations in some categories, albeit limited. Therefore, not all general categories tally to 100%. For instance, marital status can be accounted for in 99.96% of the data with an additional 0.04% with unrecorded marital status. These missing observations are infrequent and the analysis will be performed on the available data.

Table 5. Full Sample Descriptive Statistics

Independent Variables	Percent Distribution of Sample	Continuation Percentage by Category	Percent Distribution of Continuation Group
Deployment Variables			
Previously Deployed Overseas	44.04%	9.08%	44.04%
Mobilized 1-6 Months	8.71%	2.11%	10.22%
Mobilized 7-12 Months	43.48%	9.09%	43.98%
Mobilized Twice	12.41%	3.43%	16.61%
Demographic Characteristics			
Gender			
Male	97.09%	20.09%	97.20%
Female	2.91%	0.58%	2.80%
Race			
White	73.29%	14.27%	69.05%
Black	8.43%	2.14%	10.33%
Asian	4.26%	0.78%	3.78%
Other	14.02%	3.48%	16.84%
Marital Status			
Single	68.33%	14.23%	68.92%
Married	29.84%	5.93%	28.71%
Divorced	1.79%	0.49%	2.35%
Dependants			
No Children	78.32%	15.93%	77.08%
At Least 1 Child	21.68%	4.74%	22.92%
Age	25.79	N/A	N/A
Education			
Alternate High School Diploma	2.89%	0.67%	3.25%
High School Diploma	89.82%	18.46%	89.61%
Any College Degree	6.87%	1.47%	7.12%

²⁸ Denotes Standard Deviation

Independent Variables	Percent Distribution of Sample	Continuation Percentage by Category	Percent Distribution of Continuation Group
Military Performance Variables			
AFQT			
AFQT Low Quality Score (Category 3b or 4)	18.95%	4.03%	19.77%
AFQT High Quality Score (Category 1 - 3a)	79.86%	16.36%	80.23%
PFT Score			
1st Class Score	38.23%	9.38%	46.23%
2nd Class Score	29.94%	5.82%	28.70%
3rd Class Score	9.70%	1.47%	7.24%
PFT Failure	9.89%	1.37%	6.74%
Currently Deployed (exempt)	10.05%	2.17%	10.68%
Proficiency/Conduct Score	4.74	N/A	N/A
Rank			
Private (Pvt)	1.66%	0.33%	1.61%
Private First Class (PFC)	2.58%	0.44%	2.15%
Lance Corporal (LCpl)	14.65%	2.41%	11.64%
Corporal (Cpl)	56.34%	10.73%	51.91%
Sergeant (Sgt)	24.69%	6.73%	32.54%
Education Benefits			
MGIB Usage (post-9/11 only)			
MGIB used anytime during enlistment	3.10%	0.43%	2.07%
MGIB was currently being used	39.22%	8.44%	40.84%
Unit Type			
Division Unit (DIV)	53.08%	10.52%	53.89%
Logistics Unit (MLG)	27.74%	5.27%	27.01%
Air Wing Unit (MAW)	15.51%	3.73%	19.10%
Geographic Regions			
Midwest East	13.72%	2.64%	12.85%
IL, IN, MI, WI, OH			
Midwest West	4.80%	0.91%	4.44%
MO, ND, NE, KS, SD, MN, IA			
New England	5.01%	0.95%	4.62%
CT, MA, ME, NH, RI, VT			
Mid Atlantic	13.74%	2.87%	13.96%
NJ, NY, PA			
South Atlantic	18.43%	3.94%	19.19%
FL, GA, SC, NC, VA, WV, DC, MD, DE			
South East	5.92%	1.01%	4.90%
KY, TN, MS, AL			
South East Central	13.36%	2.78%	13.53%
OK, AR, TX, LA			
West Mountain	5.18%	1.03%	5.03%
AZ, NM, NV, UT, ID, CO, MT, WY			
West Pacific	19.44%	4.41%	21.48%
CA, HI, OR, WA, AK			
Unemployment Rate	5.39%	N/A	N/A

Independent Variables	Percent Distribution of Sample	Continuation Percentage by Category	Percent Distribution of Continuation Group
N=	34051	34051	34051

B. PRE-9/11 DESCRIPTIVE STATISTICS

As Table 6 indicates, the Pre-9/11 time period had virtually no mobilizations to account for and therefore the numbers are too small to consider or gain any interpretive value. What this table does provide is an accurate snapshot for all other nondeployment-related variables in the sample (with the exception of MGIB usage, which was obtained beginning in FY 2002). Table 6 represents the restricted sample of the Pre-9/11 time period.

Table 6. Pre-9/11 Period Descriptive Statistics

Independent Variables	Percent Distribution of Sample	Continuation Percentage by Category	Percent Distribution of Continuation Group
Deployment Variables			
Previously Deployed Overseas	0.26%	0.12%	0.67%
Mobilized 1-6 Months	0.02%	0.01%	0.06%
Mobilized 7-12 Months	0.02%	0.02%	0.12%
Mobilized Twice	0.00%	0.00%	0.00%
Demographic Characteristics			
Gender			
Male	98.40%	17.42%	97.92%
Female	1.60%	0.37%	2.08%
Race			
White	74.27%	12.38%	69.60%
Black	8.29%	1.74%	9.77%
Asian	3.61%	0.55%	3.11%
Other	13.84%	3.12%	17.52%
Marital Status			
Single	71.43%	12.69%	71.35%
Married	26.99%	4.75%	26.70%
Divorced	1.54%	0.35%	1.95%
Dependants			
No Children	70.39%	12.14%	68.25%

Independent Variables	Percent Distribution of Sample	Continuation Percentage by Category	Percent Distribution of Continuation Group
At Least 1 Child	29.61%	5.65%	31.75%
Age	25.76 (2.00) ²⁹	N/A	N/A
Education			
Alternate High School Diploma	2.52%	0.54%	3.05%
High School Diploma	90.43%	15.92%	89.55%
Any College Degree	6.84%	1.31%	7.39%
Military Performance Variables			
AFQT			
AFQT Low Quality Score (Category 3b or 4)	17.73%	3.23%	18.13%
AFQT High Quality Score (Category 1 - 3a)	82.24%	14.57%	81.87%
PFT Score			
1st Class Score	32.73%	7.41%	45.05%
2nd Class Score	36.47%	6.13%	37.25%
3rd Class Score	14.72%	1.87%	11.36%
PFT Failure	8.96%	0.91%	5.55%
Currently Deployed (exempt)			0.00%
Proficiency/Conduct Score	5.24	N/A	N/A
Rank			
Private (Pvt)	2.79%	0.48%	2.69%
Private First Class (PFC)	3.19%	0.43%	2.44%
Lance Corporal (LCpl)	12.27%	1.54%	8.67%
Corporal (Cpl)	57.17%	9.07%	50.98%
Sergeant (Sgt)	24.35%	6.19%	34.80%
Education Benefits			
MGIB Usage (post-9/11 only)			
MGIB used anytime during enlistment	0.00%	0.00%	0.00%
MGIB was currently being used	0.00%	0.00%	0.00%
Unit Type			
Division Unit (DIV)	52.12%	9.09%	53.65%
Logistics Unit (MLG)	28.01%	4.48%	26.41%
Air Wing Unit (MAW)	16.65%	3.38%	19.94%
Geographic Regions (by Census Region)			
Midwest East	14.18%	2.01%	11.35%
IL, IN, MI, WI, OH			
Midwest West	5.00%	0.78%	4.42%
MO, ND, NE, KS, SD, MN, IA			
New England	5.41%	0.92%	5.21%
CT, MA, ME, NH, RI, VT			
Mid Atlantic	12.82%	2.52%	14.23%
NJ, NY, PA			
South Atlantic	17.92%	3.56%	20.12%

²⁹ Denotes Standard Deviation

Independent Variables	Percent Distribution of Sample	Continuation Percentage by Category	Percent Distribution of Continuation Group
FL, GA, SC, NC, VA, WV, DC, MD, DE			
South East	5.80%	0.93%	5.28%
KY, TN, MS, AL			
South East Central	13.60%	2.53%	14.29%
OK, AR, TX, LA			
West Mountain	4.88%	0.78%	4.42%
AZ, NM, NV, UT, ID, CO, MT, WY			
West Pacific	19.95%	3.66%	20.67%
CA, HI, OR, WA, AK			
Unemployment Rate	4.36%	N/A	N/A
N=	9206	9206	9206

C. OVERLAP-9/11 DESCRIPTIVE STATISTICS

As Table 7 specifies, the Overlap-9/11 time period did have significant mobilization activity. The main focus when analyzing this time period is that increases in mobilizations during this time period vs. the pre-9/11 time period could be affecting the continuation rates based on the non-expectation to deploy at time of enlistment. Table 7 represents the restricted sample of the Overlap-9/11 time period.

Table 7. Overlap-9/11 Period Descriptive Statistics

Independent Variables	Percent Distribution of Sample	Continuation Percentage by Category	Percent Distribution of Continuation Group
Deployment Variables			
Previously Deployed Overseas	51.21%	10.08%	46.53%
Mobilized 1-6 Months	14.37%	3.44%	15.83%
Mobilized 7-12 Months	50.10%	10.25%	47.09%
Mobilized Twice	12.15%	3.11%	14.28%
Demographic Characteristics			
Gender			
Male	96.67%	21.11%	97.02%
Female	3.33%	0.65%	2.98%
Race			
White	71.50%	14.44%	66.37%
Black	9.29%	2.57%	11.81%
Asian	4.54%	0.91%	4.18%
Other	14.67%	3.84%	17.64%

Independent Variables	Percent Distribution of Sample	Continuation Percentage by Category	Percent Distribution of Continuation Group
Marital Status			
Single	67.81%	15.01%	69.05%
Married	30.40%	6.25%	28.73%
Divorced	1.74%	0.48%	2.22%
Dependants			
No Children	81.16%	17.30%	79.50%
At Least 1 Child	18.84%	4.46%	20.50%
Age	25.75 (2.31) ³⁰	N/A	N/A
Education			
Alternate High School Diploma	2.88%	0.71%	3.27%
High School Diploma	89.77%	19.47%	89.75%
Any College Degree	6.96%	1.51%	6.96%
Military Performance Variables			
AFQT			
AFQT Low Quality Score (Category 3b or 4)	20.17%	4.50%	21.00%
AFQT High Quality Score (Category 1 - 3a)	78.43%	16.92%	79.00%
PFT Score			
1st Class Score	39.36%	10.01%	46.07%
2nd Class Score	29.23%	6.17%	28.41%
3rd Class Score	9.26%	1.61%	7.40%
PFT Failure	10.29%	1.66%	7.66%
Currently Deployed (exempt)	11.42%	2.21%	10.16%
Proficiency/Conduct Score	4.62	N/A	N/A
Rank			
Private (Pvt)	1.56%	0.37%	1.71%
Private First Class (PFC)	2.64%	0.53%	2.42%
Lance Corporal (LCpl)	16.43%	3.01%	13.82%
Corporal (Cpl)	55.79%	11.32%	52.04%
Sergeant (Sgt)	23.54%	6.51%	29.91%
Education Benefits			
MGIB Usage (post-9/11 only)			
MGIB used anytime during enlistment	3.37%	0.36%	1.63%
MGIB was currently being used	57.19%	12.45%	57.24%
Unit Type			
Division Unit (DIV)	52.73%	10.94%	53.43%
Logistics Unit (MLG)	27.91%	5.48%	26.74%
Air Wing Unit (MAW)	15.35%	4.06%	19.83%
Geographic Regions (by Census Region)			
Midwest East	13.37%	2.91%	13.44%

³⁰ Denotes Standard Deviation

Independent Variables	Percent Distribution of Sample	Continuation Percentage by Category	Percent Distribution of Continuation Group
IL, IN, MI, WI, OH			
Midwest West	4.57%	0.92%	4.23%
MO, ND, NE, KS, SD, MN, IA			
New England	4.60%	0.85%	3.93%
CT, MA, ME, NH, RI, VT			
Mid Atlantic	14.19%	2.83%	13.11%
NJ, NY, PA			
South Atlantic	18.94%	4.07%	18.83%
FL, GA, SC, NC, VA, WV, DC, MD, DE			
South East	5.95%	1.07%	4.95%
KY, TN, MS, AL			
South East Central	13.11%	2.93%	13.57%
OK, AR, TX, LA			
West Mountain	5.29%	1.24%	5.75%
AZ, NM, NV, UT, ID, CO, MT, WY			
West Pacific	19.59%	4.80%	22.19%
CA, HI, OR, WA, AK			
Unemployment Rate	5.32%	N/A	N/A
N=	18027	18027	18027

D. POST-9/11 DESCRIPTIVE STATISTICS

As Table 8 describes, the Post-9/11 time period had the most significant mobilization activity of all the time periods. However, the limited data available during this time period for analysis is evident in the number of observations, 6,818 vs. the Overlap Period of 18,027 observations. During this time period, NPS reservists may expect more imminent deployment at the point of enlistment. A reflection of this can be observed in the data distinguishing it from the previous time periods (Pre-9/11 and Overlap-9/11) both among the actual percentage deployed, as well as among the percentage that continued service. Table 8 represents the restricted sample of the Post-9/11 time period.

Table 8. Post-9/11 Period Descriptive Statistics

Independent Variables	Percent Distribution of Sample	Continuation Percentage by Category	Percent Distribution of Continuation Group
Deployment Variables			
Previously Deployed Overseas	84.20%	18.51%	85.62%
Mobilized 1-6 Months	5.49%	1.42%	6.57%
Mobilized 7-12 Months	84.66%	18.28%	84.36%
Mobilized Twice	29.85%	8.93%	41.23%
Demographic Characteristics			
Gender			
Male	96.45%	20.99%	96.89%
Female	3.55%	0.67%	3.11%
Race			
White	76.71%	16.37%	75.56%
Black	6.35%	1.53%	7.04%
Asian	4.41%	0.75%	3.45%
Other	12.53%	3.02%	13.95%
Marital Status			
Single	65.49%	14.27%	65.88%
Married	32.22%	6.69%	30.87%
Divorced	2.26%	0.70%	3.25%
Dependants			
No Children	81.52%	17.42%	80.43%
At Least 1 Child	18.48%	4.24%	19.57%
Age	25.89 (2.39) ³¹	N/A	N/A
Education			
Alternate High School Diploma	3.27%	0.73%	3.41%
High School Diploma	89.13%	19.21%	89.30%
Any College Degree	6.64%	1.57%	7.24%
Military Performance Variables			
AFQT			
AFQT Low Quality Score (Category 3b or 4)	17.37%	3.89%	18.34%
AFQT High Quality Score (Category 1 - 3a)	80.43%	17.31%	81.66%
PFT Score			
1st Class Score	42.67%	10.37%	47.87%
2nd Class Score	22.98%	4.49%	20.72%
3rd Class Score	4.08%	0.56%	2.57%
PFT Failure	10.06%	1.20%	5.55%
Currently Deployed (exempt)	20.02%	4.99%	23.02%
Proficiency/Conduct Score	4.39	N/A	N/A
Rank			
Private (Pvt)	0.38%	0.03%	0.14%
Private First Class (PFC)	1.58%	0.23%	1.08%

³¹ Denotes Standard Deviation

Independent Variables	Percent Distribution of Sample	Continuation Percentage by Category	Percent Distribution of Continuation Group
Lance Corporal (LCpl)	13.13%	1.98%	9.14%
Corporal (Cpl)	58.15%	11.40%	52.61%
Sergeant (Sgt)	28.19%	8.02%	37.03%
Education Benefits			
MGIB Usage (post -9/11 only)			
MGIB used anytime during enlistment	6.56%	1.20%	5.55%
MGIB was currently being used	44.66%	9.23%	42.59%
Unit Type			
Division Unit (DIV)	55.29%	11.32%	55.38%
Logistics Unit (MLG)	26.91%	5.81%	28.41%
Air Wing Unit (MAW)	14.39%	3.31%	16.21%
Geographic Regions (by Census Region)			
Midwest East	14.02%	2.79%	12.93%
IL, IN, MI, WI, OH			
Midwest West	5.12%	1.09%	5.03%
MO, ND, NE, KS, SD, MN, IA			
New England	5.56%	1.25%	5.78%
CT, MA, ME, NH, RI, VT			
Mid Atlantic	13.80%	3.43%	15.92%
NJ, NY, PA			
South Atlantic	17.78%	4.12%	19.12%
FL, GA, SC, NC, VA, WV, DC, MD, DE			
South East	6.01%	0.94%	4.35%
KY, TN, MS, AL			
South East Central	13.71%	2.71%	12.59%
OK, AR, TX, LA			
West Mountain	5.32%	0.82%	3.81%
AZ, NM, NV, UT, ID, CO, MT, WY			
West Pacific	18.33%	4.41%	20.48%
CA, HI, OR, WA, AK			
Unemployment Rate	6.97%	N/A	N/A
N=	6818	6818	6818

E. TIME PERIOD COMPARATIVE ASSESSMENT

The descriptive statistics in Table 9 amplifies the variation in continuation percentages across time periods. Again, the Pre-9/11 time period has minimal interpretive value on continuation percentages and mobilization due to the near absence of mobilization of NPS reservists during that time period. The Overlap-9/11 and the Post-9/11 periods do present an interesting increase in the percentage of people who have

mobilized. These continuation percentages represent those reservists who have completed their contract who: (a) Continued for another 12 months and (b) Fall under the specified variable category. For example, 18.51% of reservists completing their contract continued for another 12 months and at some point deployed at least once overseas. Table 9 outlines this continuation rate comparison by time period.

Table 9. Continuation Comparison by Time Periods

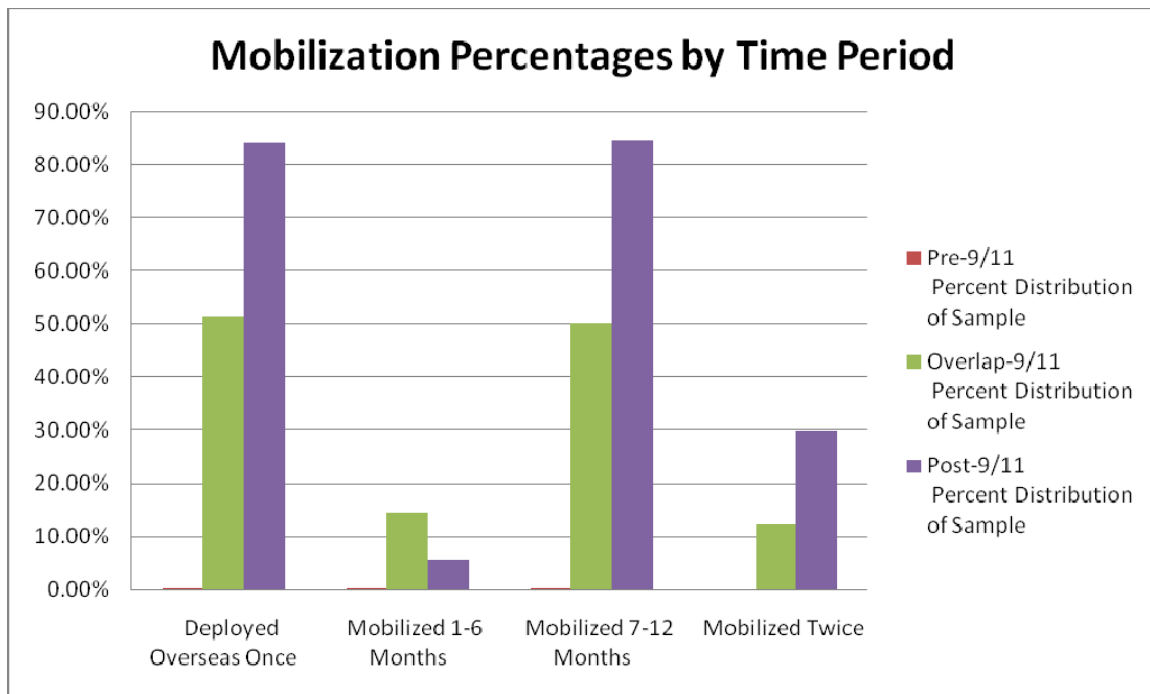
Independent Variables	Pre-9/11 Continuation Percentage by Category	Overlap-9/11 Continuation Percentage by Category	Post-9/11 Continuation Percentage by Category
Deployment Variables			
Previously Deployed Overseas	0.12%	10.08%	18.51%
Mobilized 1-6 Months	0.01%	3.44%	1.42%
Mobilized 7-12 Months	0.02%	10.25%	18.28%
Mobilized Twice	0.00%	3.11%	8.93%
Demographic Characteristics			
Gender			
Male	17.42%	21.11%	20.99%
Female	0.37%	0.65%	0.67%
Race			
White	12.38%	14.44%	16.37%
Black	1.74%	2.57%	1.53%
Asian	0.55%	0.91%	0.75%
Other	3.12%	3.84%	3.02%
Marital Status			
Single	12.69%	15.01%	14.27%
Married	4.75%	6.25%	6.69%
Divorced	0.35%	0.48%	0.70%
Dependants			
No Children	12.14%	17.30%	17.42%
At Least 1 Child	5.65%	4.46%	4.24%
Age	N/A	N/A	N/A
Education			
Alternate High School Diploma	0.54%	0.71%	0.73%
High School Diploma	15.92%	19.47%	19.21%
Any College Degree	1.31%	1.51%	1.57%
Military Performance Variables			
AFQT			
AFQT Low Quality Score (Category 3b or 4)	3.23%	4.50%	3.89%
AFQT High Quality Score (Category 1 - 3a)	14.57%	16.92%	17.31%
PFT Score			
1st Class Score	7.41%	10.01%	10.37%

Independent Variables	Pre-9/11 Continuation Percentage by Category	Overlap-9/11 Continuation Percentage by Category	Post-9/11 Continuation Percentage by Category
2nd Class Score	6.13%	6.17%	4.49%
3rd Class Score	1.87%	1.61%	0.56%
PFT Failure	0.91%	1.66%	1.20%
Currently Deployed (exempt)	0.00%	2.21%	4.99%
Proficiency/Conduct Score	N/A	N/A	N/A
Rank			
Private (Pvt)	0.48%	0.37%	0.03%
Private First Class (PFC)	0.43%	0.53%	0.23%
Lance Corporal (LCpl)	1.54%	3.01%	1.98%
Corporal (Cpl)	9.07%	11.32%	11.40%
Sergeant (Sgt)	6.19%	6.51%	8.02%
Education Benefits			
MGIB Usage (post-9/11 only)			
MGIB used anytime during enlistment	0.00%	0.36%	1.20%
MGIB was currently being used	0.00%	12.45%	9.23%
Unit Type			
Division Unit (DIV)	9.09%	10.94%	11.32%
Logistics Unit (MLG)	4.48%	5.48%	5.81%
Air Wing Unit (MAW)	3.38%	4.06%	3.31%
Geographic Regions (by Census Region)			
Midwest East	2.01%	2.91%	2.79%
IL, IN, MI, WI, OH			
Midwest West	0.78%	0.92%	1.09%
MO, ND, NE, KS, SD, MN, IA			
New England	0.92%	0.85%	1.25%
CT, MA, ME, NH, RI, VT			
Mid Atlantic	2.52%	2.83%	3.43%
NJ, NY, PA			
South Atlantic	3.56%	4.07%	4.12%
FL, GA, SC, NC, VA, WV, DC, MD, DE			
South East	0.93%	1.07%	0.94%
KY, TN, MS, AL			
South East Central	2.53%	2.93%	2.71%
OK, AR, TX, LA			
West Mountain	0.78%	1.24%	0.82%
AZ, NM, NV, UT, ID, CO, MT, WY			
West Pacific	3.66%	4.80%	4.41%
CA, HI, OR, WA, AK			
Unemployment Rate	N/A	N/A	N/A
N=	9206	18027	6818

F. PRELIMINARY ANALYSIS

1. Mobilization by Time Period

As can be determined from the descriptive statistics in Tables 6, 7, and 8, mobilizations have been increasing over time as a result of significant world events such as September 11, 2001, and the Iraq and Afghanistan conflicts. Figure 17 provides a visual representation of mobilization data from these time periods.



Source: TFDW Data, Author

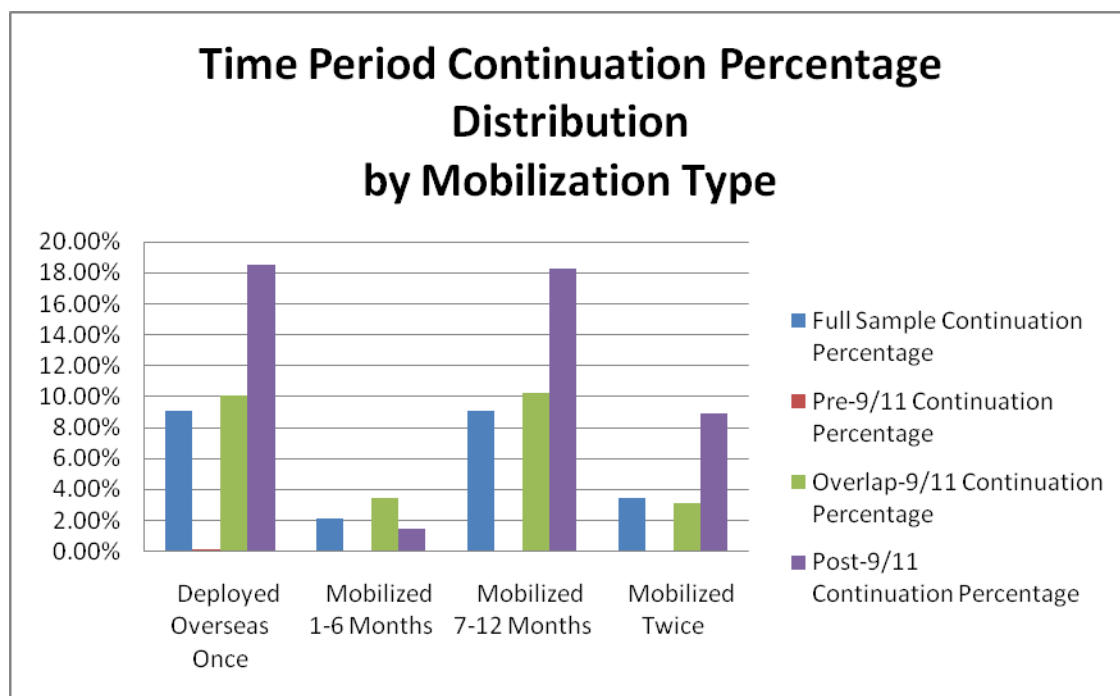
Figure 17. Mobilizations by Time Periods

As previously discussed, the NPS populations for the Pre-9/11 time period had virtually no mobilization or deployment of any type or length; whereas, during the Overlap-9/11 period about 50% of personnel have been deployed at least once, and the most significant length of deployment fell within the range of 7–12 months. By the Post-9/11 period, the percent mobilized had increased to well over 80%. Similar increases can

be seen in the other categories and by the Post-9/11 period, about 30% of NPS personnel had mobilized twice. This increase in mobilization may have an effect on continuation rates.

2. Mobilization Versus Continuation

After analyzing Figure 17, it is important to consider the actual continuation percentages within these mobilization categories. Figure 18 analyzes the continuation percentages across these variables for the three distinct time periods (Pre-9/11, Overlap-9/11, and Post-9/11 time periods).



Source: TFDW Data, Author

Figure 18. Mobilizations Versus Continuation Percentage by Time Period

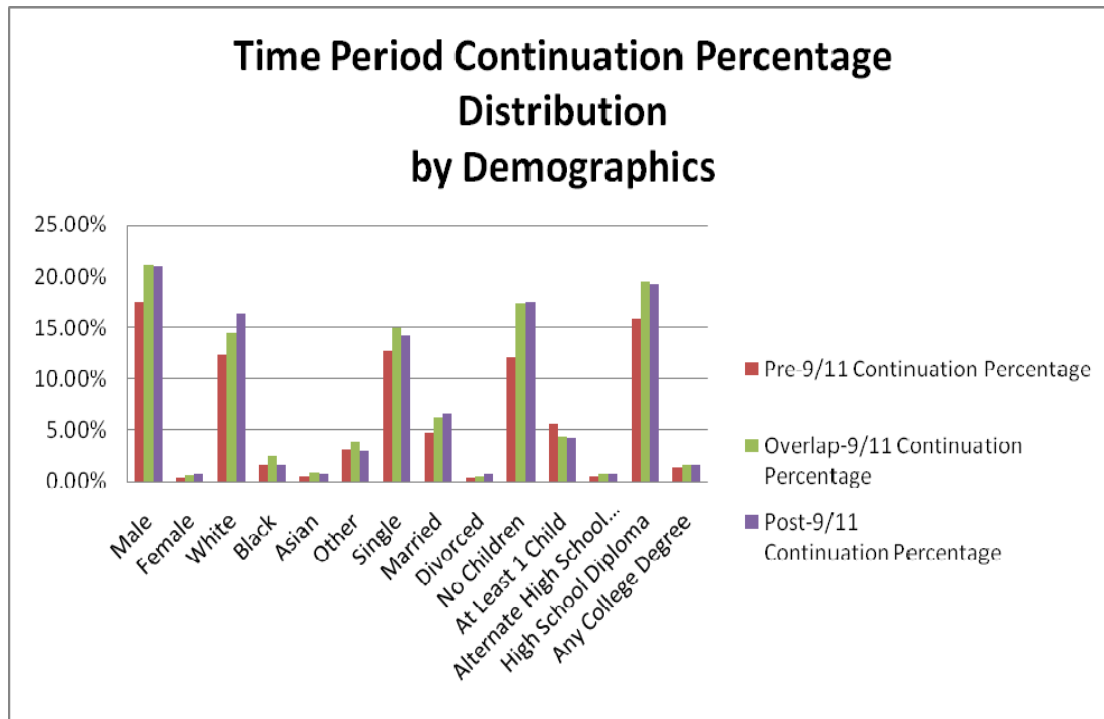
It appears that continuation percentages across mobilization types (Full Sample) are quite low and further analysis may illuminate whether there is a negative correlation between mobilization and continuation. However, the post-9/11 period appears significantly different from the general “full sample” or other time periods (Pre-9/11 and Overlap-9/11), suggesting that expectations during these time periods may be

systematically different. Consequently, mobilization during the post-9/11 period may not have the same effect on continuation rates as mobilization during other time periods. Further regression analysis will seek to clarify this.

3. Continuation by Other Explanatory Characteristics

a. Continuation Percentages by Demographics and Time Period

Now that the importance of considering mobilization has been established, we should assess other key factors that may affect continuation rates. Demographics trends provide insight into subculture patterns in general and may lend key information whether continuation rates connected to particular patterns. Figure 19 provides a continuation percentage composite for all three key time periods.



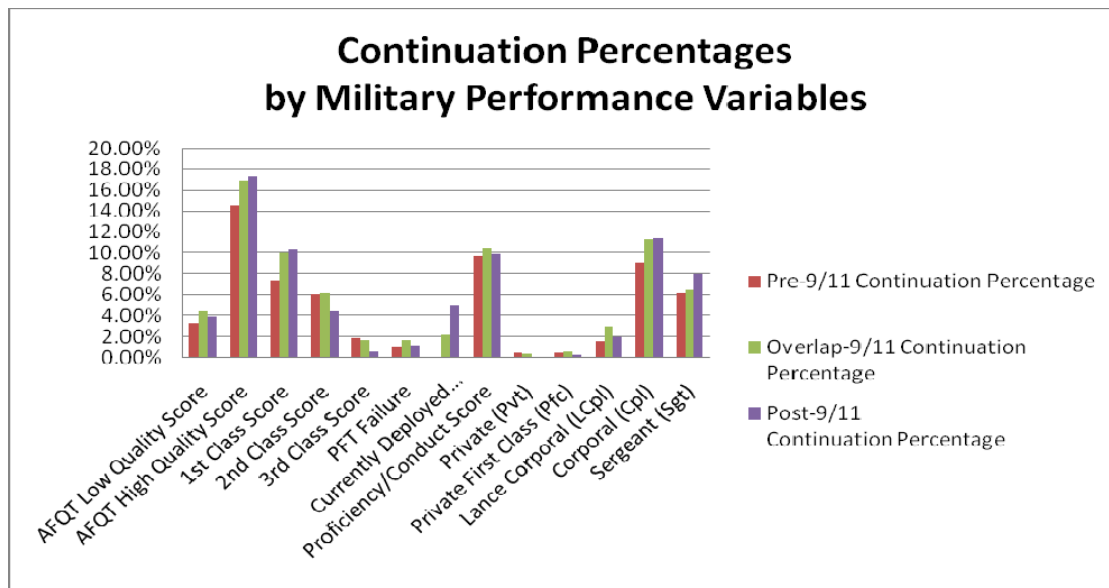
Source: TFDW Data, Author

Figure 19. Continuation Percentages by Demographics and Time Period

These continuation percentages, defined by demographic characteristics and time period, represent continuation trends occurring over the Pre-9/11, Overlap-9/11, and Post-9/11 time periods. Overall most demographic categories appeared to increase slightly in continuation percentage over time. However, this does not signify that any particular demographic has a positive/negative correlation with continuing service. Therefore, further regression analysis is needed to determine this and will be discussed in the regression results of this thesis.

b. Military Performance Variables and Continuation

Aside from demographics, it is assumed that military performance variables may help to enlighten certain factors that may affect continuation rate behavior for NPS reservists. As previously mentioned, these variables may signal certain key characteristics of a person's military adaptability, motivation, and person-job fit within the organization and thus contributing to the decision to continue participating in the SMCR unit based upon these key identifiers. Figure 20 graphically represents continuation rate distributions across all three restricted time periods by military performance variables.



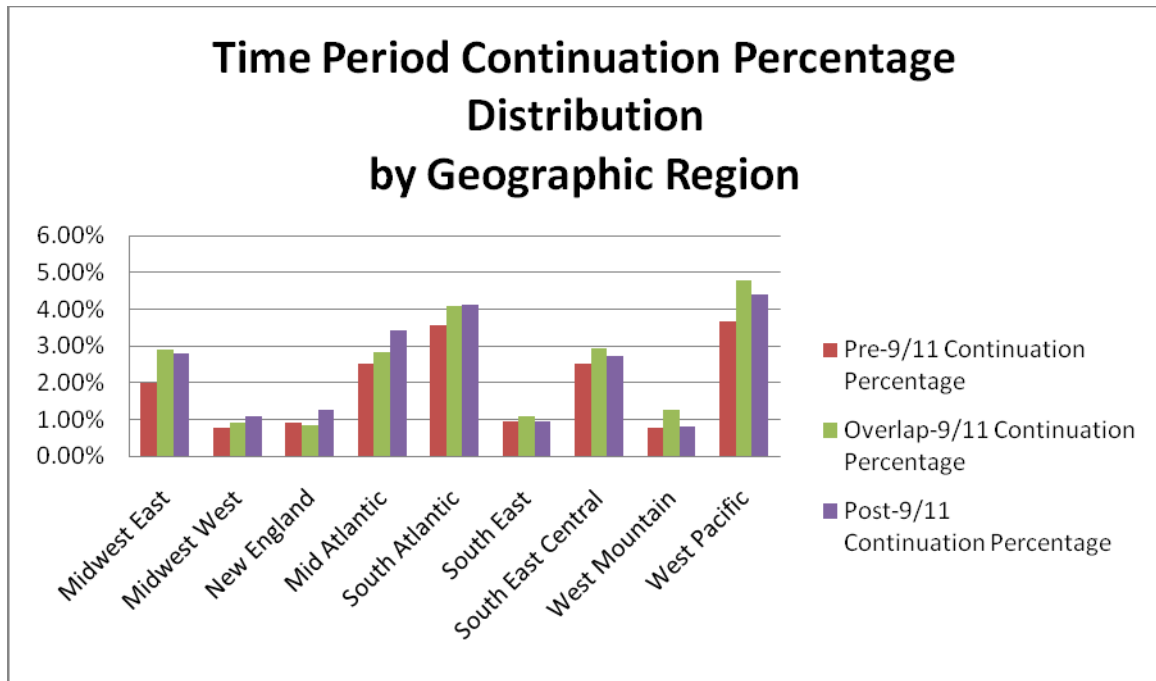
Source: TFDW Data, Author

Figure 20. Continuation Percentages by Military Performance Variables

The distribution by period and military categories reveal continuation trends over the Pre-9/11, Overlap-9/11, and Post-9/11 periods. Overall, continuation percentages appeared to remain constant over time for some categories. Categories such as AFQT High Quality, 1st Class PFT Scores, and the rank of Sergeant experienced increases in continuation over time. As an exception, continuation decreased for those with 2nd Class PFT Scores.

c. Geographic Regions and Continuation

Scrutinizing continuation rates by geographic regions will be useful in interpreting reserve behavior. Different areas of the country may have different political affiliations, varying degrees of patriotic support for those serving in the military, as well as varying economic and civilian job markets, which may potentially affect a reservist's taste for military service. Although an in-depth analysis of various geographic effects is well beyond the scope of this thesis, it is a sensible to control for region in the multivariate models. Figure 21 represents a visual portrayal of continuation percentage across the three time periods (Pre-9/11, Overlap-9/11, and the Post-9/11 period) for the nine geographic regions.



Source: TFDW Data, Author

Figure 21. Continuation Percentages by Geographic Region Variables

Overall, most geographic regions had higher continuation rates over time. Some exceptions are depicted for the South East and West Mountain regions, which appear to increase slightly during the Overlap-9/11 period but decrease back to Pre-9/11 levels for the Post-9/11 Period. The regression analysis below will examine whether region is significantly associated with continuation behavior.

G. SUMMARY

The descriptive statistics presented in this chapter outlined important key factors associated with NPS continuation rates. It highlighted the fact that NPS reserve “force utilization” has increased dramatically from before September 11, 2001 to the Post-9/11 period and appears to be linked to continuation rate patterns. Specifically, these trends for continuation rates that occurred across the Pre-9/11, Overlap-9/11, and Post-9/11 time periods, appear to be linked to mobilization type and frequency.

VIII. STATISTICAL MODEL

The approach used to test the effects of mobilization on 12-month NPS Marine Corps Reserve continuation will be to utilize a binary response model discussed in this chapter. Section A will describe the analytical method in detail and Section B will describe the mechanics of the multivariate probit regressions used in this analysis.

A. ANALYTICAL METHOD

All models performed in this thesis are probit models, which are nonlinear regression models specifically designed for a binary dependent variable. The theoretical probability model of continuation given the explanatory variables is as follows (Wooldridge, 2009, p.575–576):

$$P(y = 1 | x) = F(\beta_0 + \beta_1 x_1 + \beta_2 x_2 + \dots + \beta_k x_k)$$

where:

$y = 1$: dependent variable of continuation 12-months beyond contract completion

x : independent explanatory variables as given according to the different models

F : cumulative standard normal distribution function described by:

$$F(z) = \Phi(z) \equiv \int_{-\infty}^z \phi(v) dv$$

where the standard normal density is : $\phi(z) = (2z)^{-1/2} \exp(-z^2 / 2)$

β_i : coefficient of regression for the i variable based on maximum likelihood

These probit models will provide the probability for continuing 12-months in the SMCR units beyond the end of the 6-year drilling contract based on the explanatory variables. The probabilities of the outcomes may fall outside the 0-1 interval in a general linear probability model making the probit model superior.

B. MULTIVARIATE PROBIT REGRESSION MODELS

This analysis will utilize one full sample unrestricted model and three restricted time period models to isolate for particular time period effects during the Pre-9/11, Overlap-9/11, and Post-9/11 periods. As previously mentioned, due to correlation among the mobilization variables, for each of the restricted models tested there will be four sub-models, which will test the effects of the four mobilization variables.

Since the key concern of the research is centered on the specific mobilization effects associated with continuation, the primary independent variables will be: (1) previously deployed overseas, (2) mobilized 1–6 months, (3) mobilized 7–12 months, and (4) mobilized twice. In addition to these mobilization variables, some specific models will incorporate an interaction variable for being previously deployed overseas and mobilized twice. Ideally, this will elucidate the mutual versus individual effects between these variables. For clarity, all other explanatory variables (demographics, military performance, etc.) will be further defined at the conclusion of the model specification section.

1. Model 1: Full Sample Model

The primary purpose of the model using the full sample is to specifically analyze the overall period effects. Therefore, it utilizes dummy period variables that will account for the Overlap-9/11, and Post-9/11 time periods (compared to the Pre-9/11 base group). This model is not specifically considering the detailed approach in testing for varying effects between the mobilization variables, but rather serves to capture the necessity of analyzing this sample in three distinct time periods. Model 1A is specified as follows:

Model 1A

$$\begin{aligned} P(\text{Continuation 12 Months Beyond Contract Completion} = 1 | x) = \\ F(\beta_0 + \beta_1(\text{Overlap} - 9/11 \text{ Time Period}) \\ + \beta_2(\text{Post} - 9/11 \text{ Time Period}) + \beta_3(\text{Explanatory Variables})) \end{aligned}$$

Additionally, the variable of *previously deployed overseas* is included in Model 1B to determine whether mobilization affects continuation rates; the distinct variables that test for magnitude and frequency of mobilization are omitted from this comprehensive full sample view. Model 1B is specified as follows:

Model 1B

$$P(\text{Continuation 12 Months Beyond Contract Completion} = 1 | x) = F(\beta_0 + \beta_1(\text{Deployed Overseas Once}) + \beta_2(\text{Explanatory Variables}))$$

The above model description only details the most salient variables. As previously stated, the other key *explanatory variables* (30 additional variables considered) are detailed at the conclusion of the model specifications within this chapter (see Table 10), which further describes the various demographic and military performance variables.

2. Model 2: Pre-9/11 Time Period

Specifically, the key factor in Model 2 is the absence of deployment during this time period. As highlighted in the descriptive statistics, mobilization and deployment only applied to 0.26% of the sample. Therefore, deployment variables are omitted from Model 2 and the model focuses primarily on more standard characteristics relating to continuation. Below is Model 2 for the Pre-9/11 time period:

Model 2

$$P(\text{Continuation 12 Months Beyond Contract Completion} = 1 | x) = F(\beta_0 + \beta_1(\text{Explanatory Variables}))$$

It is important to note that NPS reservists during the Model 2 time period are likely to have joined with *no expectations of mobilizing* and, except for the extraordinarily small percentage mentioned above, *did not mobilize*. This time period is comprised of those enlisting between Fiscal Years (FY) 1992–1995 who reached the decision point to continue service between FY 1998–2001 (see Figure 9).

3. Model 3: Overlap 9/11 Time Period

In contrast to Model 2, the Overlap period for Model 3 experienced significant deployment (51% of the sample, see Table 7). In order to capture the particular effects of frequency and type of mobilizations, four sub-models are considered.

For Model 3A, the variables for mobilized 1–6 months, mobilized 7–12 months, and mobilized twice were included. The resulting Model 3A is:

Model 3A

$$P(\text{Continuation 12 Months Beyond Contract Completion} = 1 | x) = \\ F(\beta_0 + \beta_1(\text{Mobilized 1–6 Months}) + \beta_2(\text{Mobilized 7–12 Months}) + \beta_3(\text{Mobilized Twice}) \\ + \beta_4(\text{Explanatory Variables}))$$

Model 3B mirrors Model 3A, but excludes mobilized twice. The justification for applying this technique is to analyze the effect of *mobilization duration* without considering *mobilization frequency*.

Model 3B

$$P(\text{Continuation 12 Months Beyond Contract Completion} = 1 | x) = \\ F(\beta_0 + \beta_1(\text{Mobilized 1–6 Months}) + \beta_2(\text{Mobilized 7–12 Months}) \\ + \beta_3(\text{Explanatory Variables}))$$

In contrast to Model 3B, Model 3C omits *mobilization duration* but includes the *mobilized twice* variable. This serves to analyze the particular effect of mobilizing twice without regard to the duration of mobilization variables (mobilized 1–6 months and mobilized 7–12 months).

Model 3C

$$P(\text{Continuation 12 Months Beyond Contract Completion} = 1 | x) = \\ F(\beta_0 + \beta_1(\text{Mobilized Twice}) + \beta_2(\text{Explanatory Variables}))$$

Model 3D for the Overlap-9/11 time period includes mobilized twice, overseas deployment once, and the interaction term variable created for previously deployed overseas and mobilized twice. Since being previously deployed overseas and being mobilized twice are closely associated, this model attempts to tease out the mutual effects on continuation that these variables jointly produce.

Model 3D

$$\begin{aligned}
 P(\text{Continuation 12 Months Beyond Contract Completion} = 1 | x) = \\
 F(\beta_0 + \beta_1(\text{Deployed Overseas Once}) + \beta_2(\text{Mobilized Twice}) \\
 + \beta_3(\text{Deployed Overseas Once} * \text{Mobilized Twice}) \\
 + \beta_4(\text{Explanatory Variables}))
 \end{aligned}$$

It is notable that NPS reservists joining during the Model 3 Overlap-9/11 time period were likely to have *no expectations of mobilizing* but in many cases most likely *did mobilize*. Prior to the 9/11 time period, previous trends of little or no deployment could have been assumed by reservists. However, in the years immediately following 9/11, mobilizations became imminent and reservists' expectations were unmet. Consequently, deployment could have an effect on continuation behavior for groups during this period. Model 3 analyzes the effects on those who enlisted from FY 1996-2001 and who reached the decision point to continue service between FY 2002-2007 (see Figure 9).

4. Model 4: Post-9/11 Time Period

Model 4, similar to Model 3, also considers a period where deployment was a significant factor and, therefore, follows the same four sub-model analyses used in Model 3 (Overlap-9/11). Since the reasons for the particular sub-model approach coincide with those in Model 3, the sub-models for Model 4 are listed here in brevity.

Model 4A

$$P(\text{Continuation 12 Months Beyond Contract Completion} = 1 | x) = \\ F(\beta_0 + \beta_1(\text{Mobilized 1–6 Months}) + \beta_2(\text{Mobilized 7–12 Months}) + \beta_3(\text{Mobilized Twice}) \\ + \beta_4(\text{Explanatory Variables}))$$

Model 4B

$$P(\text{Continuation 12 Months Beyond Contract Completion} = 1 | x) = \\ F(\beta_0 + \beta_1(\text{Mobilized 1–6 Months}) + \beta_2(\text{Mobilized 7–12 Months}) \\ + \beta_3(\text{Explanatory Variables}))$$

Model 4C

$$P(\text{Continuation 12 Months Beyond Contract Completion} = 1 | x) = \\ F(\beta_0 + \beta_1(\text{Mobilized Twice}) + \beta_2(\text{Explanatory Variables}))$$

Model 4D

$$P(\text{Continuation 12 Months Beyond Contract Completion} = 1 | x) = \\ F(\beta_0 + \beta_1(\text{Deployed Overseas Once}) + \beta_2(\text{Mobilized Twice}) \\ + \beta_3(\text{Deployed Overseas Once} * \text{Mobilized Twice}) \\ + \beta_4(\text{Explanatory Variables}))$$

Reserve expectations for Model 4, the Post-9/11 period, were starkly in contrast to expectations in previous time periods. NPS reservists joining during this time period were likely to have *clear expectations of mobilizing* and most likely *did mobilize*. In fact, 84% of NPS reservists during this time period mobilized at least once (see Table 8). The Post-9/11 period identified for Model 4 is defined as those NPS reservists who enlisted from FY 2002–2003 and who reached the decision point to continue service between FY 2008–2009 (see Figure 14).

C. MODELS 1-4: OTHER EXPLANATORY VARIABLES

The other explanatory variables included in each model are also critical in this analysis. These variables were jointly and generically referred to as “explanatory variables” in the model specifications above. These variables include demographics, military performance, education benefits, unit type, geographic region, and the unemployment rate. As most of these variables innately define reservists, they may present a possible effect on continuation rates by sub-cultures. For example, those reservists from one particular geographic region may have a distinct commonality that affects their likelihood of continuation as opposed to those from a different geographic region. Consequently, these variables were included in Models 1–4 and they are defined below in Table 10.

Table 10. Explanatory Variables Models 1–4

Regression Base Variables and Explanatory Variables Defined		
Category	Used in Regression	Base Group
Demographics		
Gender	Female	Male
Race	Black Asian Other	White
Marital Status	Married Divorced	Single
Dependents	One or More Children	No Children
Age	Age	
Education	Alternate High School Diploma Any College Degree	High School Diploma
Military Performance		
AFQT	AFQT Low Quality Score	AFQT High Quality Score
PFT Score	2nd Class PFT Score 3rd Class PFT Score PFT Failure PFT Score Exempt (Deployed)	1st Class PFT Score PFT Exempt (Medical)
Proficiency and Conduct Score	Aggregate Pro/Con Score	

Regression Base Variables and Explanatory Variables Defined		
Category	Used in Regression	Base Group
Rank	Lance Corporal (LCpl) Sergeant (Sgt)	Private (Pvt) Private First Class (PFC) Corporal (Cpl)
Education Benefits		
MGIB Use	MGIB previously used	MGIB Currently in use
Unit Type		
	Logistics Group (MLG) Air Wing (MAW)	Division Unit (Div)
Geographic Regions		
Census Regions	Midwest East Midwest West New England Mid Atlantic South Atlantic South East South East Central West Mountain	West Pacific
Unemployment Rate (State)	Unemployment Rate	

Table 10 provides a quick reference guide to the explanatory variables utilized in the regressions, along with the variables that were used as (comparison) in the base group. Additionally, for PFT scores, PFT exempt for medical reasons was also left in the base group with the 1st Class PFT scores. PFT medically exempt only accounts for less than 1% of the total sample population. Similarly, Pvt and PFC were also left in the base group since these variables account for 1.6% and 2.6% of the population, respectively.

D. HYPOTHESIZED EFFECTS OF VARIABLES ON CONTINUATION

It is hypothesized that the explanatory variables mentioned above will significantly affect continuation rates. Table 11 details the “hypothesized effects” of each variable based on the previous research on reserve retention/continuation factors. For each explanatory variable, an effect on continuation is hypothesized for the Pre-9/11, Overlap-9/11, and the Post-9/11 time periods. For example, mobilized 7–12 months is

not given a hypothesized effect in the Pre-9/11 period due to the near absence of deployment during that period. However, in the Overlap-9/11 period, it is hypothesized that the effect of this variable will be negative since reservists' mobilization expectations were ambiguous and therefore long mobilizations could have negatively impacted their continuation. Finally, 7–12 months mobilization is hypothesized to have a positive effect on continuation in the Post-9/11 period since expectations for mobilization were clear. Hypothesized effects for the other variables are likewise delineated in Table 11.

Table 11. Hypothesized Effects of Explanatory Variables

Category	Explanatory Variable	Pre-9/11	Overlap-9/11	Post-9/11
Deployment	Previously Deployed Overseas	·	-	-
	Mobilized 1-6 Months	·	+	+
	Mobilized 7-12 Months	·	-	-
	Mobilized Twice	·	+	+
Gender	Female	+	-	-
Race	Black	+	+	+
	Asian	-	-	-
	Other	+	+	+
Marital Status	Married	-	-	-
	Divorced	+	+	+
Dependents	One or More Children	-	-	-
Age	Age	·	·	·
Education	Alternate High School Diploma	+	+	+
	Any College Degree	-	-	-
AFQT	AFQT Low Quality Score	·	·	·
PFT Score	2nd Class PFT Score	-	-	-
	3rd Class PFT Score	-	-	-
	PFT Failure	-	-	-
	PFT Exempt (Deployment)	-	-	-
Pro/Con Score	Pro/Con Score	+	+	+
Rank	Lance Corporal (LCpl)	+	+	+
	Sergeant (Sgt)	+	-	-
MGIB Usage	MGIB previously used	+	-	+
Unit Type	Marine Logistics Group (MLG)	-	-	-
	Marine Air Wing (MAW)	+	+	+
Geographic Regions	Midwest East	-	-	-
	Midwest West	+	-	-
	New England	+	-	-
	Mid Atlantic	+	-	-
	South Atlantic	+	+	+
	South East	+	+	+
	South East Central	+	+	+
	West Mountain	-	-	-
Unemployment Rate (State)	Unemployment Rate	+	+	+

IX MULTIVARIATE ANALYSIS AND RESULTS

This chapter will present the multivariate analysis results for each model emphasizing the effects of mobilization. Further discussion will be provided for statistically significant factors associated with NPS continuation findings. Full tables of the results will be available in the Appendices. Section A will discuss the techniques used for validating the statistical model. Section B will interpret the model results for the mobilization effects for each “period model” (Pre-9/11, Overlap-9/11, and Post-9/11 Models). Section C will present a supplementary results discussion with regard to the most relevant and statistically significant findings, which are in addition to the primary mobilization effects findings. Section D provides a comprehensive summary to the chapter.

A. LIKELIHOOD RATIO TEST

The Likelihood Ratio Test considers whether there is a significant difference between the unrestricted and restricted models. For each time period (null model), the likelihood ratio test will consider the significance of these sub-models, i.e. whether each of the sub-models mentioned above provide a better analysis of the data by including different mobilizations variables. The log likelihood function is as follows:

$$LR = 2(\ell_{ur} - \ell_r)$$

where ℓ_{ur} is the log likelihood for the unrestricted model and ℓ_r is the log likelihood for the restricted model (Wooldridge, 2009, p.580). If the log likelihood tests results in statistical significance, it can be concluded that at least one of the explanatory variables included in the model are beneficial in predicting continuation rates. Statistical significance will be considered for P values less than 0.05. The results of the likelihood ratio tests will be included with the regression results output tables.

B. MULTIVARIATE REGRESSION RESULTS FOR MOBILIZATION EFFECTS

As mentioned above, there are some intrinsic complexities associated with the mobilization and deployment variables. For instance, those that deployed twice may also fall into the category of those who mobilized 7–12 months. Conversely, those deployed overseas may also correspond to those who have been mobilized 1–6 months and 7–12 months or mobilized twice. Therefore, various specific models will account for this overlap by utilizing the sub-models described above. The full regression results containing all explanatory variables can be found in Appendices (B–D).

1. Model 1: Full Sample

The first step provides a broad perspective of mobilization effects and their potential relevance within the specific periods (Pre-9/11, Overlap-9/11, and Post-9/11). Table 12 provides the full sample probit regression results. For Models 1A and 1B only mobilization variables are shown, the full regression containing all 30 explanatory variables can be found in Appendix B.

Table 12. Model 1: Full Sample Mobilization Probit Model

VARIABLES	<u>Model 1A</u> (Marginal Effects)	<u>Model 1B</u> (Marginal Effects)
Overlap-9/11 Time Period Dummy	0.0399*** (0.00594)	
Post-9-11 Time Period Dummy	0.0308*** (0.00932)	
Previously Deployed Overseas		-0.0127** (0.00513)
Observations	31,585	31,566
LR χ^2	47.01	5.80
Prob > χ^2	0.0000	0.016
Degrees of Freedom	32	31
χ^2	778.7	740.0
Pseudo R ²	0.0245	0.0233
Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1		

Model 1A indicates that there is statistical significance among the Overlap-9/11 and Post-9/11 periods as compared to the base group dummy of Pre-9/11 period when mobilization variables are removed from the regression. The positive marginal effects of 4.0 percentage points ($p < 0.01$) for the Overlap-9/11 period and 3.1 percentage points ($p < 0.01$) for the Post-9/11 period indicate that continuation rates significantly increased in the later time periods as compared to the Pre-9/11 time period. The statistical significance presents justification to further examine effects occurring within each restricted time period.

For Model 1B, the variable of *previously deployed overseas* was included in the full sample regression to test for an overall deployment/mobilization effect and yielded a 1.3 percentage point decrease in continuation ($p < .05$). To examine the preliminary mobilization results further, Models 3–4 (Overlap-9/11 and Post-9/11 periods) are examined in order to place these mobilization effects into perspective. Unfortunately, Model 2 cannot provide help to interpret mobilization effects since NPS reservists hardly deployed during the Pre-9/11 period (see Table 6). Therefore, we only present effects for other non-mobilization variable interpretations.

2. Model 2: Pre-9/11 Time Period

Although the Pre-9/11 time period was inconclusive for testing mobilization effects, a general model was estimated to identify statistically significant factors associated with NPS continuation rates. Table 13 presents the results of Model 2.

Table 13. Model 2 Pre-9/11 Regression Results

VARIABLES	Model 2 Marginal Effects
Female	0.0256 (0.0359)
Black	0.0507*** (0.0172)
Asian	-0.0271 (0.0214)
Other	0.0620*** (0.0148)

VARIABLES	<u>Model 2</u> Marginal Effects
Married	-0.00345 (0.0101)
Divorced	-0.0203 (0.0308)
One or More Children	0.00444 (0.0103)
Age	0.00701*** (0.00212)
AFQT Low Quality Score	0.0105 (0.0112)
Alternate High School Diploma	0.0273 (0.0281)
Any College Degree	-0.0213 (0.0155)
Lance Corporal	-0.0119 (0.0137)
Sergeant	0.0820*** (0.0114)
Proficiency/Conduct Score	0.00618** (0.00307)
2nd Class PFT Score	-0.0423*** (0.00904)
3rd Class PFT Score	-0.0699*** (0.0104)
PFT Failure	-0.0877*** (0.0117)
Marine Air Wing	0.0178 (0.0121)
Marine Logistics Group	-0.0267*** (0.00961)
Midwest East	-0.00717 (0.0175)
Midwest West	0.0226 (0.0275)
New England	0.0337 (0.0281)
Mid Atlantic	0.0390** (0.0174)
South Atlantic	0.0453** (0.0201)
South East	0.00399 (0.0222)
South East Central	0.0403** (0.0176)

VARIABLES	<u>Model 2</u> Marginal Effects
West Mountain	-0.0126 (0.0223)
Unemployment Rate	0.00433 (0.00713)
Observations	8,264
Degrees of Freedom	28
χ^2	274.0
Pseudo R ²	0.0359
Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1	

The Pre-9/11 time period model has several variables that are statistically significant. In terms of demographics, Black NPS reservists had a 5.1 percentage point higher ($p<0.01$) probability of continuing service. The “other” race category was 6.2 percentage points less likely ($p<0.01$) to continue. Interestingly, “marital status” and “dependent” variables had no statistical significant effects on continuation.

Military performance variables of rank, proficiency and conduct score, and PFT scores all were statistically significant. Of note, NPS reservists’ who were Sergeants were 46% or 8.2 percentage points ($p<0.01$) were more likely to continue in an SMCR unit 12 months beyond their 6-year drilling contracts. This may indicate that if a reservist achieves the rank of senior noncommissioned officer, he/she may possess more intrinsic abilities, an increased pay incentive, and a desire to continue based on person job fit compatibility. The same theme may apply to reservists who receive strong proficiency and conduct marks. These factors indicate that they are 3.5% or .6 percentage points ($p<0.01$) more likely to continue 12 months beyond their completed 6-year contracts for every one-tenth of a point increase in either the actual proficiency or conduct score. Physical fitness test scores follow similar trends. The more poorly NPS reservists performed on their PFT scores, the less likely they were to continue. Specifically, those that scored 2nd class PFT scores were 24% or 4.2 percentage points less likely ($p<0.01$) to continue service. Those who scored 3rd class PFT scores and also failed their PFTs were 7.0 and 8.8 percentage points ($p<0.01$) less likely to continue. These performance

variables appear to be closely correlated with a person's particular tastes and job fit within the organization. Performing well suggests that job achievements may be correlated with job satisfaction to some degree.

Isolating for specific unit type, NPS Marines serving in a Marine Logistics Group were 2.7 percentage points less likely ($p < 0.01$) to continue. As mentioned above, unit environment can potentially affect perceptions of unit cohesion and job satisfaction and different unit types vary culturally within the Marine Corps leading to different work climates.

Geographic regions were isolated for "potential propensity to serve." The results indicate that there were three regions in this period that had higher continuation rates. The Mid Atlantic Region (NJ, NY, PA), South Atlantic Region (FL, GA, SC, NC, VA, WV, DC, MD, DE), and the South East Central Region (OK, AR, TX, LA) all had increased probabilities of continuation.

3. Model 3: Overlap-9/11 Period

Model 3 contains five primary variables of interest that measure mobilization. This model analyzes the period when reservists' expectations about being mobilized may have been less certain at their point of enlistment (refer to Figure 3) and thus creating the hypothesized potential negative continuation effects. In order to control for mobilization variables during this period, the previously stated 4 sub-models were used and depicted in Table 14. The full regression containing all 30 explanatory variables can be found in Appendix C.

Table 14. Model 3 Overlap-9/11 Period Mobilization Regression Results

VARIABLES	<u>Model 3A</u> Marginal Effects	<u>Model 3B</u> Marginal Effects	<u>Model 3C</u> Marginal Effects	<u>Model 3D</u> Marginal Effects
Mobilized 1-6 Months	0.0180* (0.0102)	0.0162 (0.0102)		
Mobilized 7-12 Months	-0.0456*** (0.00799)	-0.0286*** (0.00768)		
Mobilized Twice	0.0893*** (0.0121)		0.0633*** (0.0111)	0.161*** (0.0439)

VARIABLES	<u>Model 3A</u> Marginal Effects	<u>Model 3B</u> Marginal Effects	<u>Model 3C</u> Marginal Effects	<u>Model 3D</u> Marginal Effects
Previously Deployed Overseas				-0.0518*** (0.00752)
Previously Deployed Overseas *Mobilized Twice				-0.0637** (0.0305)
Observations	16,956	16,956	16,956	16,944
LR χ^2	88.05	26.19	35.93	93.41
Prob > χ^2	0.0000	0.0000	0.0000	0.0000
Degrees of Freedom	33	32	31	33
χ^2	504.1	442.6	452.3	509.7
Pseudo R ²	0.0288	0.0252	0.0258	0.0291
Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1				

Model 3A in Table 14 analyzes the variables of deployment frequency and duration combined together in the regression. Specifically, *mobilized 1–6 months*, *mobilized 7–12 months*, and *mobilized twice* were included in the regression in order to test for effect of deployment frequency. The results indicate that during the Overlap-9/11 period, being mobilized 1–6 months increased the probability of continuing service by 1.8 percentage points ($p<0.1$). In contrast to this, reservists who were mobilized 7–12 months, were 4.6 percentage points less likely ($p<0.01$) to continue service. Furthermore, those who were mobilized twice during this time period were 9.0 percentage points more likely ($p<0.01$) to continue compared to those who only mobilized once. These results suggest that deployment frequency is a factor in NPS continuation rates.

Model 3B isolates the impact for being mobilized 1–6 months and 7–12 months, but omits being *mobilized twice* in the regression. The results are consistent in sign direction with Model 3A but were only statistically significant for those deployed 7–12 months. Those mobilized 7–12 months were 2.9 percentage points less likely ($p<0.01$) to continue service. The results suggest that there is a negative trend in the effect of longer mobilizations. This is consistent with the previous research on mobilization frequencies for Marine reservists, where those who were mobilized in excess of 1–6 months were more likely to become a loss, and loss rates increased as mobilization length increased (Dolfini-Reed et al, 2005).

Model 3C isolates the effect of being mobilized twice in the regression and concludes that NPS reservists who mobilized twice during this time period were 6.3 percentage points more likely ($p < 0.01$) to continue. This confirms that being mobilized twice is systematically different compared to those only mobilized once at either duration (1–6 months or 7–12 months). Previous research has indicated that on average across all the service branches, reservists who were mobilized more than once had higher loss rates. However, specific effects of multiple mobilizations may mask the actual effects due to the proportion of those reservists who volunteer for additional mobilizations with other SMCR units (Dolfini-Reed et al, 2005). Therefore, the increased continuation probabilities for those who mobilized more than once may be associated with these self-selection factors. Additionally, other factors need to be considered since those who mobilize twice may be volunteering because their civilian jobs may be more supportive and may potentially impact their deployment experiences more positively than those who are involuntarily mobilized and are in civilian jobs that are not supported by reserve duty demands. Additionally, as indicated in the increased unemployment rates during the Overlap-9/11 period from the Pre-9/11 period (see Table 6 and 7) some reservists may have experienced job loss during this period of economic downturn and thus be more inclined to voluntarily mobilize more frequently.

Model 3D analyzes the interaction effect of being mobilized twice and being previously deployed overseas. The interaction term of overseas deployment once versus mobilized twice, elucidates the connection between the 2 variables. Mobilized twice by itself has an approximately 9.7% ($+0.161 + -0.0639 = .097$) positive effect on retention. In contrast, deployment at least once overseas alone has an 11.6% ($-0.0519 + -0.0639 = -0.116$) lower probability on retention. This interaction effect potentially distinguishes and validates that being mobilized twice may indeed yield an increased likelihood on continuation in SMCR units, whereas being deployed overseas at least once has negative impacts on NPS continuation.

4. Model 4: Post-9/11 Period

Model 4 also contains the same five primary variables. Just as Model 3 restricted the NPS sample exclusively to those who served in the Overlap-9/11 period, Model 4 restricts the sample for the Post-9/11 time period where reservists' expectations about being mobilized may be the most clear at their point of enlistment, given the perceptible Post-9/11 world events to include the Iraq and Afghanistan conflicts (refer to Figure 3). The mobilization results for the Post-9/11 time period are listed in Table 15. The results follow the same pattern as the Overlap-9/11 period in Model 3. The full regression output can be found in Appendix D.

Table 15. Model 4 Post-9/11 Period Mobilization Regression Results

VARIABLES	<u>Model 4A</u> Marginal Effects	<u>Model 4B</u> Marginal Effects	<u>Model 4C</u> Marginal Effects	<u>Model 4D</u> Marginal Effects
Mobilized 1-6 Months	0.0637** (0.0308)	0.0504* (0.0303)		
Mobilized 7-12 Months	-0.0385* (0.0198)	-0.00914 (0.0187)		
Mobilized Twice	0.126*** (0.0137)		0.112*** (0.0132)	0.118 (0.0923)
Previously Deployed Overseas				-0.0252 (0.0164)
Previously Deployed Overseas *Mobilized Twice				-0.00112 (0.0831)
Observations	6,365	6,365	6,365	6,359
LR χ^2	101.67	6.57	80.91	84.3
Prob > χ^2	0.0000	0.0374	0.0000	0.0000
Degrees of Freedom	33	32	31	33
χ^2	283.7	190.2	262.7	267.2
Pseudo R ²	0.0432	0.0290	0.0400	0.0407
Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1				

In Model 4A, all of the mobilization variables were statistically significant. NPS reservists who were mobilized 1–6 months had a 6.4 percentage point higher (p<0.05) probability of continuing service. This 6.4 percentage point difference is much higher in the Post-9/11 period than the 1.8 percentage point difference for mobilized 1–6 months in

the Overlap-9/11 period, and may further reinforce the previous research that suggests that decreased deployment lengths result in higher retention (Dolfini-Reed et al, 2005). Those who were mobilized 7–12 months had a 3.9 percentage point lower ($p < 0.1$) likelihood of continuing service. This is a much smaller percentage point effect than in the Overlap-9/11 period and may potentially be the first piece of evidence that the “clear expectations of mobilizations” during this period are possibly correlated with smaller negative effects on continuation. Additionally, reservists who were mobilized twice were 12.6 percentage points more likely to continue in service than those who had not been twice mobilized. This result suggests that NPS reservists serving in this time period differ from other periods for two potential reasons. First, Post-9/11 period reservists had potentially more opportunities to volunteer for additional deployments since the twice mobilized rate during this period is 30% (see Table 8 and Figure 12) as compared to the Overlap-9/11 period where twice mobilized rates were only 12% (see Table 7 and Figure 12). Second, during this Post-9/11 period, reservists may have had “clearer expectations” at the point of enlistment entry which could have led to better first time mobilization experiences. Previous studies hypothesized that reservists “willingness to serve” for further mobilizations may be linked to how disillusioned they are with the mobilization system (Dolfini-Reed et al, 2005, p.20). Hence, the “clear expectations” regarding mobilizations in the Post-9/11 time period may be cause for more “willingness to volunteer” for multiple mobilizations since their previous mobilization outlooks may be much more positive than in other time periods where expectations were uncertain.

In Model 4B, being mobilized for 1–6 months was statistically significant. Reservists who fell into this category were 5 percentage points more likely ($p < 0.1$) to continue in SMCR units. The lack of statistical significance for a 7–12 month mobilization presents an interesting finding, given that the percentage of those NPS reservists who mobilized 7–12 months during the Post-9/11 period (85%) is much higher than in the previous Overlap-9/11 period (50%) (See Tables 7 and 8). At a minimum, this finding may suggest that “clear expectations” in the Post-9/11 period lessen the negative impacts of mobilization on continuation behavior.

Model 4C indicates that for reservists who mobilized twice in the Post-9/11 period were 11.2 percentage points more likely ($p < 0.01$) to continue (compared to those who were mobilized once). This result is 5 percentage points larger than for those who were mobilized twice in the Overlap-9/11 period. Again, the potential explanation for this could be the increased opportunities to volunteer for additional mobilizations. Alternatively, “expectations may be clearer” in previous mobilizations resulting in more volunteers for a second mobilization.

Model 4D produced an interesting result where the interaction effects between those that mobilized twice and those who deployed overseas at least once were not statistically significant. Although the analysis can only utilize 2-years of waterfall data, Fiscal Years 2008 and 2009 (see Figures 3 and 9), it does present support for the hypothesis that “clear expectations” for mobilizations may cause systematic differences for NPS reservists who enlist in the Post-9/11 period (2002 and beyond). More specifically, as Figure 3 suggests, “clear expectations” of mobilizing for a reservist may be imperative since reservists need to plan around school schedules and civilian jobs. Those entering into 6-year commitments who know just how they will ultimately be utilized through the imminent possibility of mobilizing may have fewer unexpected disruptions in their civilian lives, unlike the Overlap-9/11 Period. Reservists expecting to only train during the usual 1-weekend per month and 2-weeks per year may be affected more than those who expect the higher commitment up front.

Those in the Overlap-9/11 period may have joined with virtually no expectation of deploying, and although their tastes for military service are positive, they may not anticipate having their civilian lives disrupted for 7–12 months. Loss rates will be higher since their expectations were simply not met. Reservists enlisting during the Post-9/11 period may also possess different goals than those who enlisted during the Pre-9/11 and Overlap-9/11 periods. Although this analysis may seem premature to assign, the level in which mobilization expectations explain retention during their 6-year enlistment period, it does appear to be related and is supported by this multivariate analysis. In order to validate this with more precision, further analysis will be needed to investigate data extending beyond those NPS reservists who enlisted after 2004.

C. DISCUSSION OF RETENTION EFFECTS OF OTHER EXPLANATORY VARIABLES

While not the primary focus of this thesis, this supplementary discussion presents some interesting findings that exist across the various explanatory variable categories of: Demographics, Military Performance, Unit Type, and Geographic Regions. Notably, this discussion may provide relevant insight into NPS continuation behavior that exists beyond the effects of mobilization. The full regression results are presented in Appendices B–D and Table 13.

1. Effects of Demographics on Retention

A common approach within both corporations and the military is to examine trends and patterns of personnel that occur within their organizations. Human capital is always of interest and vital to solving costly problems associated with training costs, attrition, and retention. Controlling for differences in demographic background can ultimately assist planners to mitigate future problematic patterns that may arise due to recruiting certain groups (Dolfini-Reed et al., 2005). Therefore, this analysis will present some relevant demographic findings.

First, as noted before in the descriptive statistics chapter, NPS females who complete their 6-year contracts only comprise approximately 3% of the reservists. When comparing continuation across all three time periods (Pre, Overlap, and Post-9/11), female continuation behavior appears to have changed over time. Specifically, during the Pre-9/11 time period, regression analysis revealed that female continuation was statistically insignificant whereas during the Overlap-9/11 females were on average 4.7 percentage points less likely ($p < 0.01$) to continue. On the other hand, during the Post-9/11 time period the results detail a slight shift in statistical significance. Although the marginal values are still negative and significant, the statistical level was reduced at ($p < 0.1$) from the previous ($p < 0.01$) indicating that negative continuation effects could be diminishing slightly over time and warrant future analysis into this area.

The race variables also present some insight into NPS behavior across the three time periods. NPS Blacks, Asians, and those categorized as Other Race all had

interesting trends. Blacks during the Pre-9/11 and Overlap-9/11 time periods increased from being 5 percentage points to 8 percentage points more likely ($p < 0.01$) to continue. However, during the Post-9/11 time period, the results were not significant. Asian's, however, were only statistically significant during the Post-9/11 time period where they were on average 5 percentage points less likely ($p < 0.05$) to continue as compared to whites across Models 4A-4D. For those categorized as "Other Race," the patterns were similar to Blacks where they had strong propensity to continue in service during the Pre-9/11 and Overlap-9/11 time periods, yet only indicated positive statistical significance for 2 out of the 4 sub-model within the Post-9/11 period. These trends may suggest that key racial categories have less of an effect on continuation rates as time progresses into the Post-9/11 period. Further research in this area is also needed.

The dependents category revealed some unique findings that contrast to those of active duty studies. Empirical research on first term active-duty Marines and deployments has indicated higher reenlistment rates for both those who are married and married with dependents (Quester et al., 2006). This study's results indicated the opposite effect: being married resulted in lower continuation for NPS reservists. Also, a shift seemed to occur between the Pre-9/11 and Overlap-9/11 time periods. Prior to 9/11, being married had no effect on continuation (a time of no deployment requirements), whereas during the Overlap-9/11 period, married reservists were 2.9 percentage points less likely ($p < 0.01$) to continue. However, being married in the Post-9/11 period was not significant. This potentially suggests that "clear expectations" may also be correlated with continuation propensity. As previous research has revealed (Grissmer, 1992), spousal attitudes towards reserve service plays a large role in retention and could be linked to the results for the Post-9/11 time period. Reservists who know they will be mobilized will most likely share this expectation with their spouses, who in turn, are also made aware of the potential future sacrifice associated with deployment.

Divorce patterns are also eye-catching whereas being divorced in the Pre-9/11 and Overlap-9/11 periods was not significant. However, during the Post-9/11 period, being divorced resulted in a 9.4 percentage point higher probability ($p < 0.05$) of continuation. This figure is confounding and may further support the basic premise that spousal

impacts are important and that time spent away from home during lengthy mobilization does affect a person's propensity to continue in service (compared to those who are divorced). However it should be considered that divorced NPS reservists only account for 1.79% of the population and, therefore, it is difficult assign definitive conclusions.

Finally, having one or more children increased the likelihood for continuation on average by 2.6 to 3.4 percentage points between the Overlap-9/11 and Post-9/11 time periods. While being married decreases the probability of continuing, having children has the opposite effect. Logically, this could be due to the added responsibility of providing for children and therefore a desire to maintain a stable employment status. Further analysis will be needed to help determine potential reasons associated with this pattern.

2. Effects of Military Performance Variables on Retention

Military service demands a great deal of adaptability, as well as the physical, mental, and technical capability to perform in high stress environments. Therefore, it is important to investigate the effect of military performance characteristics on continuation. Furthermore, much of the person's ability to perform in a military setting also reflects person-job fit. The results revealed that both physical fitness scores and proficiency and conduct scores had positive effects on continuation. As indicated in the full regression results across all three time periods, NPS reservists who scored 2nd class and below for the PFT were less likely to continue in service as compared against those who had a 1st Class score. Also, those who averaged high proficiency and conduct marks "during the Overlap-9/11 period only" were more likely to continue in service by .8 percentage points ($p < 0.01$). These results support the notion that performing well signals a person's compatibility within a job, as well as a person's ability, which can be linked to greater motivation.

3. Effects of Unit Type on Retention

When compared against Marine Division Units, NPS reservists who served in a Marine Logistics Group were less likely to continue service for the Pre-9/11 and Overlap-

9/11 periods (by 2.7 and 1.9 percentage points, respectively). However, during the Post-9/11 period, the coefficients were statistically insignificant. This shift necessitates the need for further analysis. Moreover, NPS Marines serving in Marine Air Wing were statistically more likely to continue in the Overlap and Post-9/11 time periods. This could be due to a multitude of factors but does imply that a systematic difference may exist among those serving within these three different job climates.

4. Effects of Geographic Region on Continuation

As previously mentioned, this analysis utilized regional dummy variables to isolate for unobserved “propensity to serve.” However, the analysis has provided a framework for future study in this area. There is much to be gained from investigating the effect of geography as CNA researchers have found this to be a relevant and an important retention factor. Commonly referred to as *neighborhood effects*, this approach attempts to model how people’s behavior is affected by those who are similarly situated (Dolfini-Reed et al., 2005, p.30). Additionally, reserve participation in general has already been identified by CNA as a problem that is related to metropolitan size. Larger metropolitan areas have higher drill site unit populations versus rural areas, leading to staffing difficulties among certain drill sites (Dolfini-Reed & Bowling, 2010). For example, many reserve units experience both under-recruiting and over-recruiting as a result of specific variations in geographic population densities, as well as, experience problems of demographic mix within certain units based on their locations. Thus, the consideration of geographic regions can add great depth to the overall analysis and could help improve Marine Corps recruiting strategies for certain regions.

The South East region had the highest negative continuation probabilities in the Overlap and Post-9/11 periods. Over time, the marginal effects reached as high as 9 percentage points ($p < 0.01$). This negative retention effect in this region necessitates further investigation. The Mid-Atlantic and New England regions were only affected by negative continuation probability during the Overlap-9/11 period. Both regions are in the upper northeast and further analysis would be required to examine whether possible economic and other factors that may be associated with reserve continuation behavior.

Lastly, NPS reservists serving in the West Mountain region had statistically significant results for the Post-9/11 period only and were 8.2 percentage points less likely to continue.

D. SUMMARY

In summary, regression analysis has shown that mobilization frequency and type are potentially correlated with continuation rates, and that the effect varies by period. Specifically, during the Overlap-9/11 and Post-9/11 periods, being mobilized 1–6 months tends to have more positive impacts on continuation rates as compared to the mobilization duration of 7–12 months. This finding is in line with previous CNA research pertaining to deployment tempo and frequency for Marine reservists (Dolfini-Reed & McHugh, 2007).

We find that NPS reservists who have been previously deployed overseas during the Overlap-9/11 period are less likely to continue. This effect was statistically insignificant during the Post-9/11 period. Reservists who mobilize twice have higher probabilities of continued service during the Overlap-9/11 and Post-9/11 models. Also, as hypothesized, varying types of mobilization expectations across the three time periods (Pre-9/11, Overlap-9/11, and Post-9/11) present unique and systematic differences that may strongly influence a reservist's decision to continue or leave. Nonetheless, further analysis will be required to bolster this conclusion. The limited number of observations available for the Post-9/11 time period (N=6,365) are one primary problem that may obstruct more definitive findings and conclusions, along with higher variations of deployment between the Overlap-9/11 and Post-9/11 time periods since the mobilization rates for the Overlap-9/11 and Post-9/11 time periods were 51% and 84%, respectively.

Also, this thesis finds that key demographic, military performance, unit type, and geographic region variables significantly affect retention. These additional findings have allowed greater insight into specific characteristics and patterns associated with NPS reserve behavior as a whole, as well as have earmarked several key additional avenues to explore in future research.

X. CONCLUSIONS AND RECOMMENDATIONS

A. REVIEW OF RESEARCH GOALS AND METHODS

The primary goal of this thesis was to identify the effect of mobilization on Marine Corps non-prior service (NPS) personnel continuation in SMCR units. Due to the increased mobilization of reservists in the Post-9/11 period, it was essential to gain insight on how this may be affecting continuation behavior. Additionally, the research considered the changes in reservists' expectations on mobilization and their effect on continuation decisions in three different time periods—Pre-9/11, Overlap-9/11, and the Post-9/11 periods.

Since the NPS reserve population is dominated by the 6x2 service contract-type among obligors, it is of vital interest to the Marine Corps to critically analyze continuation behavior of this group. Significantly, NPS reservists account for approximately 98% of all obligors. However, continuation rates among those who have completed their contract in this group are approximately 19%. Consequently, the impact of retention behavior among this group is critical to both Marine Corps accession practices, as well as the surrounding issues that pertain to growing a healthy senior reserve force. Thus, NPS reservists in SMCR units constituted the population of interest for this research.

The research utilized monthly TFDW data of NPS reserve enlisted personnel who have completed their initial 6-year obligated drilling contracts. In order to capture the focal point “waterfall time period,” monthly snapshots of data were utilized encompassing the time period from end-of-obligated-service through 12-months beyond completion. The analyses of effects, dependent on time period, were separated after the initial analysis of the full data sample. Subsequently, the key enlistment periods were categorized as: Pre-9/11, Overlap-9/11, and Post-9/11. The Pre-9/11 period was selected based on NPS reservists who completed their contracts during Fiscal Years (FY) 1998–2001. The Overlap-9/11 period was defined as those enlisting between FY 1996–2001 and completing their contracts during FY 2002 – 2007, thus capturing reservists who had

no expectation of mobilizing but who likely did mobilize. Finally, the Post-9/11 period was defined to capture reservists who enlisted during FY 2002–2003, in a period where mobilizations appeared imminent and could be clearly expected by enlistees.

Due to the increased mobilization and deployment demands caused by world events stemming from September 11, 2001, such as the ongoing Iraq and Afghanistan conflicts, mobilization effects on continuation is a primary focus of this thesis. Consequently, mobilization effects were considered along both the frequency and duration dimensions. The thesis analyzes the following categories: those who deployed overseas at least once, those who mobilized 1–6 months, those who mobilized 7–12 months, and those who mobilized twice.

As a supplementary insight on other factors that may be associated with NPS continuation, the multivariate models also included independent variables associated with demographics, ability, job performance, rank, military experience, and primary occupational specialty, unit type, unemployment rates, geographic location, and Montgomery GI Bill (MGIB) benefits. Consideration of the above categories offered additional perspective as well as controlled for factors aside from mobilization that could affect continuation rates.

B. PRIMARY RESEARCH OUTCOMES

The thesis found that mobilization frequency and duration were important factors explaining NPS reserve continuation, with effects defined by period. During the Overlap-9/11 period when reserve mobilization expectations were undefined, overseas deployment had a statistically negative effect on continuation rates. In contrast, during the Post-9/11 period, with clear mobilization expectations, overseas deployment did not statistically affect continuation rates. Consequently, it is plausible to infer that overseas deployment does not negatively impact continuation if initial expectations of deployment are clear. Additionally, multiple mobilizations had a positive impact on continuation past the end of the first contract, which may be affected by the self-selecting nature of NPS reservists who have volunteered for additional deployments.

Mobilization duration effects differed across the Overlap and Post-9/11 time periods, where reserve expectations were different. During the Overlap-9/11 period, a 1–6 month mobilization had a small positive effect on continuation, which increased in significance in the Post-9/11 time period. Accordingly, while a reservist would be slightly more likely to continue during the Overlap-9/11 time period if they had previously mobilized for 1–6 months a similar reservist in the Post-9/11 period would be even more likely to continue. In comparison, a mobilization of 7–12 months during the Overlap-9/11 time period had a strong negative effect on continuation, but a somewhat smaller effect in the Post-9/11 time period.

Among the demographic factors that predict continuation, race was of notable interest. During the Pre-9/11 and Overlap-9/11 periods, being black had a statistically significant positive effect on continuation. However, by the Post-9/11 period, this effect became neutral; suggesting that being black may no longer be an important continuation predictor. In a similar trend, being married during the Overlap-9/11 time period had a negative effect on continuation while having at least one child had a strong positive effect; the significance of both of these factors diminished during the Post-9/11 period. Other factors that indicated a significant effect on continuation were military performance, MGIB usage, unit type, and geographical location.

C. RECOMMENDATIONS

This thesis analyzed key continuation factors among NPS reservists who completed their initial 6-year drilling contracts. However, future analysis is recommended to determine whether the significant predictors of continuation correspond to significant predictors of attrition. Therefore, a study of NPS attrition utilizing this data and similar research considerations would be beneficial to determine factors that might simultaneously mitigate attrition and support continuation.

Although this thesis revealed trends through the Pre-9/11, Overlap-9/11, and Post-9/11 time periods, available data limited the scope of the Post-9/11 analysis to the years of 2002 and 2003. In order to further validate the trends illuminated by this research a follow-up study of NPS reservists who enlisted after 2003 is highly recommended. This

would present a more comprehensive view of the Post-9/11 period, as well as bring a current perspective on the operational posture that now exists in post-OIF.

Based on the results presented in this thesis, a mobilization of 7–12 months appears to have a more negative effect on continuation than a mobilization of shorter duration. Consequently, it is recommended that shorter deployment lengths be considered as a primary mobilization type in order to mitigate the detrimental effects on continuation. Since shorter 1–6 months mobilization had a significantly positive effect on continuation, these types of mobilizations would be the preferred *modus operandi*. Although this is the ideal case, from an operational effectiveness standpoint, it may not be entirely realistic.

For future consideration, it would be important to incorporate an analysis of monetary effects on continuation rates. Specifically, enlistment and reenlistment bonuses could help identify pecuniary factors to an individual's decision to continue service in the reserves. However, since reenlistment bonus policy was only recently changed in 2011 to provide for bonus eligibility prior to contract completion, it is left as a recommendation for future study when data becomes available.

In summary, this research analyzed the effects of observable factors on NPS continuation decisions. While deployment and demographic aspects were shown to be significant, they could not account for the intangible aspects of an individual's retention decision. These intangible considerations include, but are not limited to, spousal support, leadership, and morale. Therefore, future research would be needed to provide a broader view of NPS reserve continuation behavior, by merging the results of this thesis research with a study of qualitative factors.

APPENDIX A. TFDW SEQUENCE LISTING

Mar 1972 - Dec 1980		Mar 1981 - Dec 1989		Mar 1990 - Feb 1998		Mar 1998 - Feb 2001		Mar 2001 - Feb 2004		Mar 2004 - Feb 2007		Mar 2007 - Feb 2010	
Seq	Date	Seq	Date	Seq	Date	Seq	Date	Seq	Date	Seq	Date	Seq	Date
1	31Mar72	37	31Mar81	73	31Mar90	109	31Mar98	145	31Mar01	181	31Mar04	217	31Mar07
2	30Jun72	38	30Jun81	74	30Jun90	110	30Apr98	146	30Apr01	182	30Apr04	218	30Apr07
3	30Sep72	39	30Sep81	75	30Sep90	111	31May98	147	31May01	183	31May04	219	31May07
4	31Dec72	40	31Dec81	76	31Dec90	112	30Jun98	148	30Jun01	184	30Jun04	220	30Jun07
5	31Mar73	41	31Mar82	77	31Mar91	113	31Jul98	149	31Jul01	185	31Jul04	221	31Jul07
6	30Jun73	42	30Jun82	78	30Jun91	114	31Aug98	150	31Aug01	186	31Aug04	222	31Aug07
7	30Sep73	43	30Sep82	79	30Sep91	115	30Sep98	151	30Sep01	187	30Sep04	223	30Sep07
8	31Dec73	44	31Dec82	80	31Dec91	116	31Oct98	152	31Oct01	188	31Oct04	224	31Oct07
9	31Mar74	45	31Mar83	81	31Mar92	117	30Nov98	153	30Nov01	189	30Nov04	225	30Nov07
10	30Jun74	46	30Jun83	82	30Jun92	118	31Dec98	154	31Dec01	190	31Dec04	226	31Dec07
11	30Sep74	47	30Sep83	83	30Sep92	119	31Jan99	155	31Jan02	191	31Jan05	227	31Jan08
12	31Dec74	48	31Dec83	84	31Dec92	120	28Feb99	156	28Feb02	192	28Feb05	228	28Feb08
13	31Mar75	49	31Mar84	85	31Mar93	121	31Mar99	157	31Mar02	193	31Mar05	229	31Mar08
14	30Jun75	50	30Jun84	86	30Jun93	122	30Apr99	158	30Apr02	194	30Apr05	230	30Apr08
15	30Sep75	51	30Sep84	87	30Sep93	123	31May99	159	31May02	195	31May05	231	31May08
16	31Dec75	52	31Dec84	88	31Dec93	124	30Jun99	160	30Jun02	196	30Jun05	232	30Jun08
17	31Mar76	53	31Mar85	89	31Mar94	125	31Jul99	161	31Jul02	197	31Jul05	233	31Jul08
18	30Jun76	54	30Jun85	90	30Jun94	126	31Aug99	162	31Aug02	198	31Aug05	234	31Aug08
19	30Sep76	55	30Sep85	91	30Sep94	127	30Sep99	163	30Sep02	199	30Sep05	235	30Sep08
20	31Dec76	56	31Dec85	92	31Dec94	128	31Oct99	164	31Oct02	200	31Oct05	236	31Oct08
21	31Mar77	57	31Mar86	93	31Mar95	129	30Nov99	165	30Nov02	201	30Nov05	237	30Nov08
22	30Jun77	58	30Jun86	94	30Jun95	130	31Dec99	166	31Dec02	202	31Dec05	238	31Dec08
23	30Sep77	59	30Sep86	95	30Sep95	131	31Jan00	167	31Jan03	203	31Jan06	239	31Jan09
24	31Dec77	60	31Dec86	96	31Dec95	132	29Feb00	168	28Feb03	204	28Feb06	240	28Feb09
25	31Mar78	61	31Mar87	97	31Mar96	133	31Mar00	169	31Mar03	205	31Mar06	241	31Mar09
26	30Jun78	62	30Jun87	98	30Jun96	134	30Apr00	170	30Apr03	206	30Apr06	242	30Apr09
27	30Sep78	63	30Sep87	99	30Sep96	135	31May00	171	31May03	207	31May06	243	31May09
28	31Dec78	64	31Dec87	100	31Dec96	136	30Jun00	172	30Jun03	208	30Jun06	244	30Jun09
29	31Mar79	65	31Mar88	101	31Mar97	137	31Jul00	173	31Jul03	209	31Jul06	245	31Jul09
30	30Jun79	66	30Jun88	102	30Jun97	138	31Aug00	174	31Aug03	210	31Aug06	246	31Aug09
31	30Sep79	67	30Sep88	103	30Sep97	139	30Sep00	175	30Sep03	211	30Sep06	247	30Sep09
32	31Dec79	68	31Dec88	104	31Oct97	140	31Oct00	176	31Oct03	212	31Oct06	248	31Oct09
33	31Mar80	69	31Mar89	105	30Nov97	141	30Nov00	177	30Nov03	213	30Nov06	249	30Nov09
34	30Jun80	70	30Jun89	106	31Dec97	142	31Dec00	178	31Dec03	214	31Dec06	250	31Dec09
35	30Sep80	71	30Sep89	107	31Jan98	143	31Jan01	179	31Jan04	215	31Jan07	251	31Jan10
36	31Dec80	72	31Dec89	108	28Feb98	144	28Feb01	180	29Feb04	216	28Feb07	252	28Feb10
Note 1: The TFDW contains reserve data from Dec 1994(sequence 92) to current. The data was added to the TFDW in 2000.													
Note 2: Sequences 1 through 103 are Quarterly. Monthly cycles began on Sequence 104													
Note 3: The TFDW used HMF data from March 1976 (sequence 17) through June 1988 (sequence 66). This data was added in January 2008.													
Note 4: GWOT data starts September 2001 (sequence 161) to current. This data was added to the TFDW in July 2007.													

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APPENDIX B. FULL SAMPLE REGRESSION RESULTS

VARIABLES	<u>Model 1A</u> Marginal Effects	<u>Model 1B</u> Marginal Effects
Female	-0.0324** (0.0128)	-0.0302** (0.0129)
Black	0.0658*** (0.00948)	0.0652*** (0.00946)
Asian	-0.0226** (0.0110)	-0.0208* (0.0110)
Other	0.0474*** (0.00743)	0.0478*** (0.00743)
Married	-0.0193*** (0.00547)	-0.0163*** (0.00549)
Divorced	0.0353* (0.0181)	0.0394** (0.0182)
At Least one Child	0.0215*** (0.00651)	0.0177*** (0.00644)
Age	0.00103 (0.00106)	0.00105 (0.00106)
AFQT Low Quality Score	0.00790 (0.00592)	0.00828 (0.00592)
Alternate High School Diploma	0.0133 (0.0138)	0.0139 (0.0138)
Any College Degree	-0.0147* (0.00892)	-0.0142 (0.00893)
Lance Corporal	-0.00360 (0.00738)	-0.00371 (0.00737)
Sergeant	0.0686*** (0.00609)	0.0715*** (0.00610)
Proficiency/Conduct Score	0.00742*** (0.00180)	0.00492*** (0.00177)
2nd Class PFT Score	-0.0295*** (0.00530)	-0.0334*** (0.00528)
3rd Class PFT Score	-0.0600*** (0.00720)	-0.0662*** (0.00703)
PFT Failure	-0.0707*** (0.00730)	-0.0735*** (0.00722)
PFT Exempt (deployed)	-0.0237*** (0.00751)	-0.0131 (0.00802)
MGIB used during Enlistment	-0.0848*** (0.0103)	-0.0789*** (0.0106)
Marine Air Wing Unit	0.0315*** (0.00680)	0.0317*** (0.00682)
Marine Logistics Group Unit	-0.0149*** (0.00535)	-0.0146*** (0.00535)
Midwest East	-0.0125 (0.00801)	-0.00987 (0.00806)
Midwest West	-0.00316 (0.0120)	0.00295 (0.0120)

VARIABLES	<u>Model 1A</u> Marginal Effects	<u>Model 1B</u> Marginal Effects
New England	-0.00909 (0.0116)	-0.00327 (0.0117)
Mid Atlantic	-4.57e-05 (0.00819)	0.00486 (0.00824)
South Atlantic	-0.00104 (0.00827)	0.00495 (0.00823)
South East	-0.0403*** (0.0101)	-0.0364*** (0.0102)
South East Central	0.000284 (0.00839)	0.00422 (0.00842)
West Mountain	-0.0147 (0.0110)	-0.0139 (0.0111)
Unemployment Rate (state)	0.00652*** (0.00181)	0.00988*** (0.00150)
Served during Overlap-9/11 Period	0.0399*** (0.00594)	
Served during the Post-9/11 Period	0.0308*** (0.00932)	
Previously Deployed Overseas		-0.0127** (0.00513)
Observations	31,585	31,566
LR χ^2	47.01	5.80
Prob > χ^2	0.0000	0.0160
Degrees of Freedom	32	31
χ^2	778.7	740.0
Pseudo R ²	0.0245	0.0233

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

APPENDIX C. OVERLAP-9/11 REGRESSION RESULTS

VARIABLES	<u>Model 3A</u> Marginal Effects	<u>Model 3B</u> Marginal Effects	<u>Model 3C</u> Marginal Effects	<u>Model 3D</u> Marginal Effects
Mobilized 1-6 Months	0.0180* (0.0102)	0.0162 (0.0102)		
Mobilized 7-12 Months	-0.0456*** (0.00799)	-0.0286*** (0.00768)		
Mobilized Twice	0.0893*** (0.0121)		0.0633*** (0.0111)	0.161*** (0.0439)
Female	-0.0460*** (0.0163)	-0.0467*** (0.0163)	-0.0443*** (0.0164)	-0.0512*** (0.0160)
Black	0.0821*** (0.0129)	0.0817*** (0.0129)	0.0814*** (0.0129)	0.0805*** (0.0129)
Asian	-0.00827 (0.0155)	-0.00901 (0.0154)	-0.00828 (0.0155)	-0.00937 (0.0154)
Other	0.0509*** (0.0103)	0.0502*** (0.0103)	0.0511*** (0.0103)	0.0519*** (0.0103)
Married	-0.0288*** (0.00764)	-0.0280*** (0.00765)	-0.0294*** (0.00763)	-0.0282*** (0.00763)
Divorced	0.0275 (0.0252)	0.0299 (0.0254)	0.0247 (0.0250)	0.0288 (0.0252)
At Least one Child	0.0332*** (0.00967)	0.0327*** (0.00966)	0.0324*** (0.00966)	0.0335*** (0.00967)
Age	-0.000140 (0.00145)	-0.000169 (0.00145)	-0.000208 (0.00145)	-0.000526 (0.00145)
AFQT Low Quality Score	0.00499 (0.00803)	0.00392 (0.00802)	0.00405 (0.00802)	0.00281 (0.00800)
Alternate High School Diploma	0.0127 (0.0192)	0.0142 (0.0192)	0.0154 (0.0193)	0.0147 (0.0192)
Any College Degree	-0.0135 (0.0125)	-0.0149 (0.0125)	-0.0129 (0.0125)	-0.0125 (0.0125)
Lance Corporal	0.00239 (0.00996)	0.00138 (0.00995)	0.00352 (0.00999)	0.00183 (0.00994)
Sergeant	0.0569*** (0.00853)	0.0612*** (0.00856)	0.0560*** (0.00853)	0.0584*** (0.00855)
Proficiency/Conduct Score	0.00850*** (0.00242)	0.00832*** (0.00243)	0.00901*** (0.00243)	0.00870*** (0.00242)
2nd Class PFT Score	-0.0300*** (0.00743)	-0.0300*** (0.00745)	-0.0264*** (0.00745)	-0.0299*** (0.00743)
3rd Class PFT Score	-0.0583*** (0.0103)	-0.0573*** (0.0104)	-0.0524*** (0.0105)	-0.0583*** (0.0103)
PFT Failure	-0.0621*** (0.0104)	-0.0614*** (0.0104)	-0.0567*** (0.0106)	-0.0612*** (0.0104)
PFT Exempt (deployed)	-0.0387*** (0.0102)	-0.0300*** (0.0103)	-0.0469*** (0.00977)	-0.0278*** (0.0106)
MGIB used during Enlistment	-0.119*** (0.0125)	-0.116*** (0.0128)	-0.119*** (0.0125)	-0.119*** (0.0124)
Marine Air Wing Unit	0.0480*** (0.00964)	0.0451*** (0.00959)	0.0451*** (0.00959)	0.0395*** (0.00953)

VARIABLES	<u>Model 3A</u> Marginal Effects	<u>Model 3B</u> Marginal Effects	<u>Model 3C</u> Marginal Effects	<u>Model 3D</u> Marginal Effects
Marine Logistics Group Unit	-0.0204*** (0.00745)	-0.0175** (0.00748)	-0.0210*** (0.00745)	-0.0169** (0.00748)
Midwest East	-0.00449 (0.0113)	-0.00331 (0.0114)	-0.00495 (0.0113)	0.000777 (0.0115)
Midwest West	-0.0105 (0.0169)	-0.0160 (0.0166)	-0.000455 (0.0173)	-0.0116 (0.0168)
New England	-0.0369** (0.0154)	-0.0325** (0.0156)	-0.0323** (0.0156)	-0.0352** (0.0155)
Mid Atlantic	-0.0367*** (0.0107)	-0.0265** (0.0109)	-0.0306*** (0.0108)	-0.0314*** (0.0107)
South Atlantic	-0.0218* (0.0117)	-0.0246** (0.0116)	-0.0109 (0.0118)	-0.0179 (0.0117)
South East	-0.0396*** (0.0142)	-0.0431*** (0.0141)	-0.0372*** (0.0144)	-0.0344** (0.0144)
South East Central	-0.00561 (0.0115)	-0.00685 (0.0115)	-0.00267 (0.0116)	-0.00168 (0.0116)
West Mountain	0.0117 (0.0164)	0.00633 (0.0162)	0.0217 (0.0167)	0.0127 (0.0165)
Unemployment Rate (state)	0.00479 (0.00385)	0.00282 (0.00384)	0.0125*** (0.00366)	0.00520 (0.00380)
Previously Deployed Overseas				-0.0518*** (0.00752)
Previously Deployed Overseas * Mobilized Twice				-0.0637** (0.0305)
Observations	16,956	16,956	16,956	16,944
LR χ^2	88.05	26.19	35.93	93.41
Prob > χ^2	0.0000	0.0000	0.0000	0.0000
Degrees of Freedom	33	32	31	33
χ^2	504.1	442.6	452.3	509.7
Pseudo R ²	0.0288	0.0252	0.0258	0.0291

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

APPENDIX D. POST-9/11 REGRESSION RESULTS

VARIABLES	<u>Model 4A</u> Marginal Effects	<u>Model 4B</u> Marginal Effects	<u>Model 4C</u> Marginal Effects	<u>Model 4D</u> Marginal Effects
Mobilized 1-6 Months	0.0637** (0.0308)	0.0504* (0.0303)		
Mobilized 7-12 Months	-0.0385* (0.0198)	-0.00914 (0.0187)		
Mobilized Twice	0.126*** (0.0137)		0.112*** (0.0132)	0.118 (0.0923)
Female	-0.0454* (0.0255)	-0.0477* (0.0255)	-0.0404 (0.0259)	-0.0448* (0.0255)
Black	0.0342 (0.0230)	0.0346 (0.0230)	0.0332 (0.0230)	0.0324 (0.0229)
Asian	-0.0498** (0.0225)	-0.0543** (0.0224)	-0.0481** (0.0227)	-0.0489** (0.0226)
Other	0.0264 (0.0163)	0.0272* (0.0163)	0.0267 (0.0163)	0.0275* (0.0163)
Married	-0.0220* (0.0125)	-0.0179 (0.0126)	-0.0213* (0.0125)	-0.0206 (0.0125)
Divorced	0.0918** (0.0395)	0.102** (0.0399)	0.0895** (0.0393)	0.0914** (0.0394)
At Least one Child	0.0270* (0.0159)	0.0263* (0.0159)	0.0274* (0.0159)	0.0273* (0.0159)
Age	-0.00175 (0.00231)	-0.00237 (0.00232)	-0.00158 (0.00231)	-0.00169 (0.00231)
AFQT Low Quality Score	0.0119 (0.0139)	0.0139 (0.0140)	0.0111 (0.0139)	0.0113 (0.0139)
Alternate High School Diploma	-0.00645 (0.0277)	0.00271 (0.0284)	-0.00786 (0.0276)	-0.00713 (0.0277)
Any College Degree	0.00142 (0.0213)	-0.00774 (0.0209)	0.00134 (0.0213)	0.00152 (0.0213)
Lance Corporal	-0.0139 (0.0183)	-0.0175 (0.0182)	-0.0130 (0.0183)	-0.0133 (0.0184)
Sergeant	0.0726*** (0.0138)	0.0802*** (0.0139)	0.0704*** (0.0137)	0.0702*** (0.0137)
Proficiency/Conduct Score	0.00149 (0.00532)	0.00354 (0.00534)	0.000909 (0.00532)	0.00144 (0.00532)
2nd Class PFT Score	-0.0159 (0.0133)	-0.0178 (0.0133)	-0.0161 (0.0133)	-0.0161 (0.0133)
3rd Class PFT Score	-0.0644*** (0.0234)	-0.0658*** (0.0234)	-0.0656*** (0.0233)	-0.0661*** (0.0232)
PFT Failure	-0.0813*** (0.0171)	-0.0844*** (0.0171)	-0.0822*** (0.0171)	-0.0829*** (0.0170)
PFT Exempt (deployed)	-0.0316** (0.0135)	0.0104 (0.0139)	-0.0310** (0.0134)	-0.0292** (0.0136)
MGIB used during Enlistment	-0.0632*** (0.0176)	-0.0515*** (0.0185)	-0.0633*** (0.0176)	-0.0624*** (0.0176)
Marine Air Wing Unit	0.0285* (0.0161)	0.0198 (0.0159)	0.0300* (0.0161)	0.0269* (0.0161)

VARIABLES	<u>Model 4A</u> Marginal Effects	<u>Model 4B</u> Marginal Effects	<u>Model 4C</u> Marginal Effects	<u>Model 4D</u> Marginal Effects
Marine Logistics Group Unit	0.0113 (0.0126)	0.00872 (0.0126)	0.0146 (0.0126)	0.0137 (0.0127)
Midwest East	-0.0404** (0.0165)	-0.0309* (0.0170)	-0.0461*** (0.0163)	-0.0454*** (0.0163)
Midwest West	-0.00547 (0.0253)	-0.0145 (0.0248)	-0.00876 (0.0251)	-0.00928 (0.0250)
New England	-0.00801 (0.0248)	0.00209 (0.0256)	-0.0170 (0.0241)	-0.0146 (0.0243)
Mid Atlantic	0.0219 (0.0192)	0.0236 (0.0193)	0.0197 (0.0191)	0.0209 (0.0191)
South Atlantic	-0.00781 (0.0179)	-0.00897 (0.0179)	-0.0122 (0.0177)	-0.0124 (0.0177)
South East	-0.0852*** (0.0192)	-0.0817*** (0.0197)	-0.0902*** (0.0188)	-0.0889*** (0.0189)
South East Central	-0.0215 (0.0186)	-0.0293 (0.0184)	-0.0286 (0.0183)	-0.0274 (0.0183)
West Mountain	-0.0781*** (0.0205)	-0.0853*** (0.0200)	-0.0806*** (0.0203)	-0.0845*** (0.0201)
Unemployment Rate (state)	0.00730*** (0.00246)	0.00511** (0.00245)	0.00689*** (0.00245)	0.00681*** (0.00246)
Previously Deployed Overseas				-0.0252 (0.0164)
Previously Deployed Overseas* Mobilized Twice				-0.00112 (0.0831)
Observations	6,365	6,365	6,365	6,359
LR χ^2	101.67	6.57	80.91	84.30
Prob > χ^2	0.0000	0.0374	0.0000	0.0000
Degrees of Freedom	33	32	31	33
χ^2	283.7	190.2	262.7	267.2
Pseudo R ²	0.0432	0.0290	0.0400	0.0407

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

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Alexandria, Virginia